

**ASSESSING THE BIOLOGICAL WEAPONS
AND BIOTERRORISM THREAT**

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Comments pertaining to this report are invited and should be forwarded to: Director, Strategic Studies Institute, U.S. Army War College, 122 Forbes Ave, Carlisle, PA 17013-5244.

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FOREWORD

It is nearly 15 years since biological weapons (BW) have become a significant national security preoccupation. This occurred primarily due to four circumstances, all of which occurred within a short span of years. The first, beginning around 1990 and repeated many times in the years that followed, was the official U.S. Government suggestion that proliferation of offensive BW programs among states and even “nonstate actors” – terrorist groups – was an increasing trend. The second was the discovery, between 1989 and 1992, that the Union of Soviet Socialist Republics (USSR) had violated the Biological Weapons Convention (BWC) since its ratification in 1975 and had built a massive covert biological weapons program, the largest the world had ever seen. The third was the corroboration by the United Nations Special Commission (UNSCOM) in 1995 that Iraq had maintained a covert biological weapons program since 1974, and had produced and stockpiled large quantities of agents and delivery systems between 1988 and 1991. The last was the discovery, also in 1995, that the Japanese Aum Shinrikyo group, which had carried out the nerve gas attack in the Tokyo subway system, also had spent 4 years attempting – albeit unsuccessfully – to produce and disperse two pathogenic biological agents.

The events of September 11, 2001, although not in any way related to BW, combined with the distribution of professionally prepared anthrax spores through the U.S. postal system in the weeks afterwards, magnified previous concerns by orders of magnitude. In December 2002, after U.S. forces had overrun much of the territory of Afghanistan, it was discovered that the al-Qaida organization also had spent several years trying to obtain the knowledge and means to produce biological agents. These new factors shifted the context in which BW was considered almost entirely to “bioterrorism.” Within 4 years, almost \$30 billion in federal expenditure was appropriated to counter the anticipated threat. This response took place in the absence of virtually any threat analysis. The purpose of this monograph is to begin to fill that gap.



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SUMMARY

This monograph is comprised of six substantive sections. An opening introductory section sets the global context in which the threat of “bioterrorism” should be placed. It briefly surveys other nonmilitary challenges to national and global security that the United States and other nations currently face, and will face in the coming decades. It does so, where possible, by including the mortality levels currently resulting from these factors, particularly natural disease agents, and the levels that can be projected for them. This provides a comparative framework within which bioterrorism can more properly be assessed.

The second section, using U.S. Government sources, surveys the evolution of offensive state biological weapons programs. This demonstrates that official estimates of the number of such programs have diminished by between one-fourth and one-third, from a peak of some 13 nations in mid-2001. What is known regarding any proliferation from these programs is also surveyed, as well as state assistance to nonstate actors.

The third section surveys the evolution of the efforts by nonstate actors—terrorist groups—to obtain, develop, and use biological agents. The survey covers the entire 20th century, and up to the present day, focusing on the last 25 years. The efforts by the two groups which involved the most serious attempts to produce biological agents, the Japanese Aum Shinrikyo group between 1990-94 and the al-Qaida organization in Afghanistan between 1997-98 and December 2001, are reviewed in detail. Using information provided by declassified documents, as well as information from other sources, this section provides as detailed an examination as is available of the BW efforts of the al-Qaida organization.

The Japanese Aum group did not succeed in obtaining virulent strains of pathogens, nor was it apparently capable of working successfully with the strains that it did have. The al-Qaida group also appears not to have been able to obtain pathogens, nor to have reached the stage of laboratory work by the time U.S. military forces occupied Afghanistan.

As the most significant examples available, these highlight all the more the unique character of the anthrax postal mailings in the fall of 2001 in the United States. The quality of the material that was distributed demonstrates the dangerous possibilities that could be achieved. However, until the perpetrator is identified, and unless it becomes possible to exclude any links with the U.S. biodefense program, it remains impossible to assess the relevance of this event as an indicator of what might be expected from international terrorist organizations.

The fourth section reviews the public portrayal of the BW threat by U.S. officials. It includes a review of official and unofficial exercise scenarios that have been carried out in the past half-dozen years, as well as recommended planning scenarios proposed by U.S. Government agencies. It includes a very detailed examination of several of these scenarios. Many of the exercises are predicated on the repeated use of the aerosolized pathogens which produce plague and smallpox. These pathogens are not easy to obtain, and they are relatively difficult to work with. Producing aerosolized formulations of them is far beyond the current or near-term capabilities of any identified international terrorist group.

The fifth and final section discusses the impact of the U.S. biodefense research program on the possible future development of biological weapons. A significant issue is the interaction of constraints and limitations imposed by the terms of the Biological Weapons Convention, an international treaty which the U.S. Government was instrumental in bringing about, and the greatly expanded U.S. biodefense research program already in progress and set out in planning documents for the near future. The current lack of departmental and government-wide oversight over these programs is noted.

The monograph ends with a brief section of conclusions, including policy recommendations.

PART I

INTRODUCTION

Speaking at the World Economic Forum in Davos, Switzerland, on January 27, 2005, U.S. Senate Majority Leader William Frist stated that “The greatest existential threat we have in the world today is biological.” He added the prediction that “an inevitable bio-terror attack” would come “at some time in the next 10 years.”¹ He was seconded by Dr. Tara O’Toole, head of the Center for Biosecurity at the University of Pittsburgh: “This [bioterrorism] is one of the most pressing problems we have on the planet today.”²

Are these statements realistic?

Are they even proximately realistic?

By way of the most cursory comparison, one can set potential bioterrorism against:

- Global climate change, which could affect populations in every corner of the globe, alter the current growth cycles of food crops that have evolved over millennia, and consequently food production;³
- Ocean quality deterioration, deforestation, desertification, depletion of fresh-water aquifers – all of these are also global in impact;⁴
- The complex of global population growth, food production, energy and other resource constraints, and the waste products – solid, liquid and gaseous – produced by human society and the impact of these on regional and global ecosystems;
- Between 224.5 and 236 million people died in the 20th century in wars and conflict – say, roughly 230 million.⁵ This early in the 21st century, it is impossible to say whether the harvest of conflict-related deaths will be any different in the 21st century than it was in the 20th century.
- If one adds deaths due to poverty, the figures become astronomical. Jeffrey Sachs currently estimates this sum

worldwide at 20,000 people per day, or 7.3 million per year, approximately 75 million over a 10-year period.⁶ Some portion of the deaths that Sachs counts may be due to treatable disease: these are discussed separately below.

- A working group convened by the Strategic Assessments Group of the Central Intelligence Agency (CIA) and the RAND Corporation in September 2004 listed 10 “future national security threats . . . to the United States” looking ahead to 2020. Of the 10, one was “proliferation of weapons of mass destruction (WMD)” and a second was “new health threats, such as severe acute respiratory syndrome (SARS).” There was no mention of the use of biological weapons by a terrorist group.⁷
- Turning to the 1999 Millennium Project list of “The 15 Global Challenges We Face at the Millennium,” only 1 of the 15 dealt with disease agents: “What can be done to reduce the threat of new and reemerging diseases, and the increasing number of immune micro-organisms.” It did not include consideration of “bio-terrorism” at all.⁸
- No attempt is made in this monograph to draw parallels—or to attempt a comparison of relative risk or potential consequences—between the prospect of “bioterrorism” and cyberterrorism.⁹ This is despite the fact that hundreds of attacks on U.S. Department of Defense (DoD) computers and on national infrastructure targets take place every day of the year, and that numerous successful penetrations have occurred. Available data a full decade ago indicated that as many as 250,000 attacks on DoD computers took place in 1995. A 1996 Government Accountability office (GAO) report characterized 65 percent of them as “successful.”¹⁰
- Within a 10-day period between April 6 and April 16, 2005, no fewer than five other competitors were announced as being the most dire threat faced by nations:
 - nuclear terrorism;¹¹
 - 640 million small arms and light weapons around the world, which are responsible for an estimated 300,000 deaths per year;¹²

- a terrorist attack using high explosives aimed at cooling ponds holding stored irradiated nuclear reactor rods at civil nuclear power plants, leading to reactor core meltdown and radiation release analogous to the Chernobyl reactor disaster;¹³
- the possibility of impact of an asteroid with the earth;¹⁴ and
- a missile attack that would detonate a nuclear explosive over the United States producing an Electromagnetic Pulse (EMP) “. . . that could come not only from terrorist organizations like al Qaeda but from rogue nations such as Iran or North Korea.”¹⁵

To complete the picture, Rogelio Pfirter, Director General of the United Nations Organization for the Prohibition of Chemical Weapons, stated, perhaps unsurprisingly, that “. . . chemical terrorism has been identified in different regions of the world as the number one potential threat.”¹⁶

If one looks only at disease and other human public health concerns, we see the following:

- Three diseases alone—malaria, tuberculosis, and human immuno-deficiency virus/acquired immune deficiency syndrome (HIV/AIDS)—kill 5 million people globally year in, year out. In 2004, that sum reportedly reached 6 million.¹⁷ In 1 decade, that is 50 million dead. And although the contribution of HIV/AIDS to this sum is more recent, the overall total has apparently been roughly the same for many years past. Projected HIV/AIDS mortality estimates are available for the decade to come, and will very likely produce another 50 million dead due to these three diseases. Falciparum malaria is estimated to currently infect 515 million people worldwide, with 2.2 billion people—one out of every three people in the world—at risk of infection. The cost of malaria to the economy of African nations alone is estimated at \$12 billion per year.¹⁸ Malaria is preventable or treatable. Tuberculosis currently infects nearly 1 billion people, and 1 billion new cases are anticipated by 2020, 35 million of whom will die.

The direct impact on the United States of global infectious disease was recognized by the U.S. Government in 1996 by the establishment of “. . . a national policy to address the threat of emerging infectious diseases through improved domestic and international surveillance, prevention, and response measures,” and a standing Task Force in the National Science and Technology Council (NSTC) to coordinate those efforts,¹⁹ and by a January 2000 National Intelligence Estimate titled *The Global Infectious Disease Threat and Its Implications for the United States*.²⁰

- Diarrheal diseases kill 3.5 million people per year. Most are preventable. The number can be considered more or less constant over many years, and would mean roughly 35 million dead over a period of 10 years.²¹
- When the Framework Convention on Tobacco Control—a global anti-tobacco treaty—came into effect on February 27, 2005, World Health Organization (WHO) authorities stated that smoking kills 13,500 people per day, or 5 million people per year.²² That is another 50 million people every 10 years. The world has an estimated 1.2 billion smokers, and notably the United States (and China) are among the treaty signatories that have, however, not ratified it. In this sum are 500,000 deaths per year due to smoking in European Union (EU) countries, and probably an additional half to two-thirds that number in Russia.
- On March 4, 2005, WHO announced that measles mortality had dropped from 873,000 in 1999 to 530,000 in 2003.²³ That amounts to 3.6 million dead in the past 5 years. As measles mortality was over 1 million children alone per year “as recently as a decade ago,” that would mean around 10 million for the decade 1989 to 1999, and the same for preceding decades. (In early 2005, the nongovernmental organization (NGO) Doctors Without Borders, claimed that measles was still “killing nearly a million children every year.”)²⁴ Almost all nonimmune children will contract measles if exposed to the virus. The measles vaccine has been available for 40 years. Immunization costs U.S. \$0.30 per vaccination.

- Between the 22 years from 1977 to 1999, flu killed 788,000 people in the United States, an average of 36,000 people per year.²⁵ Even if there is no outbreak of pandemic flu, one can project another 360,000 flu-related deaths in the United States alone in the coming decade.

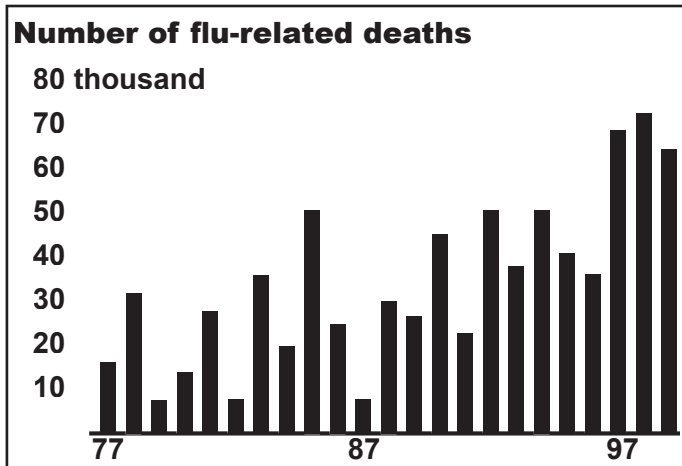


Figure 1.

- WHO officials have been warning for years of the imminence of a pandemic flu outbreak. They have warned that the pandemic was “almost inevitable,” and long overdue.²⁶ There were three influenza pandemics in the 20th century. The worst was the 1918-19 “Spanish flu.” Estimates of the mortality it caused range from a low of 20 million to higher estimates of over 50 million worldwide and even 100 million.²⁷ The Asian flu of 1957-58 killed about 1 million people globally, while the third flu pandemic, the 1968-79 Hong Kong flu, killed an estimated 1-4 million people.²⁸

Flu pandemics usually occur about every 20 to 30 years, and it has now been 40 years since the last one. The H5N1 avian flu strain, which first appeared in the 1997 Hong Kong outbreak, is still believed to be generally incapable of person-to-person transmission. Until very recently, the human lethality of the H5N1 strain was considered to be approximately 50 percent of those infected. However, it is now

understood that the actual incidence of infection is substantially higher, due to cases that produce atypical symptoms or do not show any symptoms at all, as well as because of underreporting from affected countries such as Laos, Cambodia, and China.²⁹ While this happily means that lethality is actually lower than 50 percent, it also means that the chance of recombination to a human-transmissible variant is very much higher, since a much larger population is being infected.

What has been feared for the past half-dozen years is the recombination of the H5N1 avian flu in a person or animal simultaneously infected with a human flu strain, so that the recombinant would acquire the ability to be spread from person to person. Such a recombinant strain would display the lethality of the strain that caused the 1918 to 1921 flu pandemic which killed tens of millions worldwide. On February 23, 2005, the WHO Asia Director stated that "The world is now in the gravest possible danger of a pandemic."³⁰ Dr. Julie Gerberding, head of the U.S. Centers for Disease Control and Prevention, told a meeting of the American Association for the Advancement of Science 2 days earlier that avian flu poses the single biggest threat to the world at present, the "most important threat that we are facing right now."³¹ Even Dr. Anthony Fauci, Director of the National Institute for Allergy and Infectious Diseases, has finally discovered the seriousness of pandemic flu. Dr. Fauci, who in recent years made bioterrorism his main preoccupation and the subject of many public statements, acknowledged on February 28, 2005, that "the possibility of an influenza pandemic . . . is a greater threat today than bioterrorism."³² On March 21, 2005, Dr. Fauci presented the keynote address at the 2005 Bio Defense Research Meeting of the American Society for Microbiology. His address was titled "Influenza and Bird Flu: The Ultimate Threats."³³

At the end of May 2005, Dr. Peter Cordingly, the WHO Regional Coordinator for Asia, stated that analyses of flu transmission in the preceding months had led to "strong suspicions that person-to-person transmission had taken place in two foci, one in Vietnam and one in Thailand," and possibly a third in Cambodia. The H5N1 strain was continuing to evolve. "It's learning to live in the human house, and that is potentially very worrying." The fatality rate also continues to drop, and there is confirmed evidence of asymptomatic infection.³⁴

Cordingly added that on the basis of the timeline demonstrated in the 1957-58 outbreak, the pandemic could begin within 6 months of demonstration of sustained person-to-person transmission.³⁵ In recent Senate testimony, Dr. Craig Venter suggested that “outbreaks and spread of avian and other flu virus strains . . . could potentially kill hundreds of millions and wreak havoc with our global health system.”³⁶ Dr. Venter may have had advance notice of the report of the Global Task Force for Influenza, which appeared in the May 26, 2005, issue of *Nature*. This report predicted that 20 percent of the world’s population would be infected in a flu pandemic, but estimated that perhaps only 7.5 million people would die.³⁷ Writing in the special issue of *Foreign Affairs* in the summer of 2005, Dr. Michael Osterholm extrapolated estimates of the 1917-18 pandemic flu mortality to the current world population and arrived at 180 to 360 million deaths.³⁸

However, the U.S. Fiscal Year 2006 budget is to provide \$4.2 billion to the Department of Health and Human Services for biodefense programs, \$1.76 billion of which will go to NIH for biodefense research. At the same time, NIH will only be spending \$120 million—less than one-tenth as much—for work on influenza.³⁹ Imagine, in the current climate, what the reaction of the U.S. Administration, Congress, the media, and bioterrorism publicists would be if an agency were predicting with near certainty that “bioterrorists” were “about to launch a biological weapons attack that would kill somewhere between 10 and 100 million people, perhaps more.”⁴⁰

- On March 1, 2005, 758 microbiologists sent an open letter to NIH Director Elias Zerhouni criticizing NIH expenditure priorities which greatly favored research grant funds for the “select agent” pathogens of particular interest to biodefense. The supplementary materials that accompanied the letter included a brief discussion of the spread of antibiotic resistance to major human pathogens:

The 2003 National Academy of Sciences report “Microbial Threats to Health” warned that “The world is facing an imminent crisis in the control of infectious diseases as the result of a gradual but steady increase in the resistance of a number of microbial agents to available therapeutic drugs,” and recommended that “The U.S. Secretary of Health and Human Services should ensure the formulation and implementation of a national strategy for developing new antimicrobials.”

These threats are posed by bacterial agents now established in human populations. Tuberculosis is in global resurgence. The World Health Organization projects that there will be more than 10 million new cases of tuberculosis in 2005 and that there will be nearly 1 billion new infected people by 2020, 200 million of whom will become seriously ill, and 35 million of whom will die. Additional threats are posed by other bacterial agents, including the agents responsible for salmonellosis, shigellosis, borreliosis, legionellosis, ehrlichiosis, pertussis, syphilis, gonorrhea, chlamydia, meningococcal infections, and staphylococcal infections. For each of these agents, strains resistant to multiple current antibiotics have emerged, and strains resistant to all current antibiotics have emerged or are expected soon to emerge.⁴¹

In all of the above, which has been by way of introduction, two groups of global problems faced by humankind are listed. The second group enumerates only a few pathogen and public-health problems, with an annual mortality of above 11 million people per year. So, is bioterrorism “the greatest existential threat we have in the world today”? And is it “one of the most pressing problems we have on the planet today”?

No. Absolutely not. That is clearly demonstrated by the above examples.

A 2003 report for the Century Foundation nevertheless noted, that the 2001 “Amerithrax” events demonstrated that “. . . bioterrorism could have an uncertain, far reaching, and potentially devastating impact.”⁴² The statement that the release of a biological pathogen by a terrorist group should be considered as an occurrence of “low probability but high impact” is correct, but only with important qualifications. It does not mean any release of any agent formulation under any circumstances. Rather, it presumes the release of a very high quality product, efficiently distributed under optimum conditions. Later sections of this monograph return to this question in more detail.

There were repeated statements in 1999, most prominently in the September 1999 GAO report, *Combating Terrorism: Need for Comprehensive Threat and Risk Assessment of Chemical and Biological Attacks*, that no threat analysis of this subject—an examination of

specific potential actors, their capabilities and intentions, and potential feasibilities—had ever been prepared inside the U.S. Government.⁴³ U.S. Government Accountability Office (GAO) reports for several years afterwards indicated that this situation had not changed. The task in this monograph is—in brief—to provide an evaluation of the overall problem, including several aspects rarely considered as being themselves contributions to the threat. This will be done by examining the following subjects:

- The evolution of state biological weapons programs.
- The evolution of nonstate actors (“terrorist”) biological weapon capabilities.
- Framing “the threat” and setting the agenda of public perceptions and policy prescriptions.
- Costs and consequences of the U.S. biodefense research and development (R&D) program.

A threat assessment of the potential for the use of biological agents by terrorist groups is a very different exercise than that customarily faced in providing military threat assessments. No one ever did a threat assessment of a Soviet T-34 tank, the *Galosh* antiballistic missile (ABM) system that encircled Moscow, or an *Akula*-class nuclear attack submarine (SSN) without those systems actually existing. Declassification of historical intelligence estimates of the capabilities of forces and weapon systems that U.S. forces might have confronted have certainly provided examples of inaccurate evaluations.⁴⁴ Nevertheless, performance characteristics and capabilities were often reasonably well known. Threat estimation of potential bioterrorism is as different as possibly can be from the assessment of a real operational system. It is almost purely hypothetical, and rarely, if ever, is predicated on a specific identifiable group and its capabilities. The range of possible assumptions is enormous, the utilization of extreme worst-case assumptions is the rule, and these universally depend on the projection of capabilities into the future, rather than their existence at the present time.

PART II

THE EVOLUTION OF STATE BIOLOGICAL WEAPONS PROGRAMS

Information derived solely from official U.S., Russian, and United Kingdom (UK) sources has been available since 1988 which specifies how many and which nations maintain offensive biological weapon programs. Official U.S. Government statements repeated for many years that there had been four nations in possession of offensive biological weapons programs in 1972 at the time of the signing of the Biological and Toxin Weapon Convention (BTWC), and that this number had increased to ten by 1989. (See Table 1.) In November 1997, the Director of the U.S. Arms Control and Disarmament Agency (ACDA), in the course of a statement to BTWC negotiating states in Geneva, increased the U.S. estimate to 12 nations. The additional two states have never been identified by U.S. officials. In July 2001, a U.S. Government official stated that 13 countries had offensive biological weapons (BW) programs.⁴⁵

There has been no equivalent statement or revised estimate since. All through the 1990s, it was common—in fact, nearly universal—for commentators to depict the proliferation of state BW programs as a constantly increasing trend. For example, Ambassador Donald Mahley, the senior U.S. diplomat to all multilateral negotiations in Geneva concerning chemical and biological weapons, stated in an October 1996 Voice of America broadcast that “It is estimated that over the last several years, the number of countries suspected of having a biological weapons capability has risen.”⁴⁶ However, it seems very possible that it may have been a more or less stable constant for the last 20 years. Moreover there were several notable reductions or deletions from the list in the past decade. Since the overall total was not very large to begin with, that would be a very significant reduction:

- The BW program of South Africa was terminated by 1995.⁴⁷
- On November 1, 2002, U.S. Undersecretary of State John Bolton stated that “Libya has an offensive BW program in the research and development stage, and it may currently be

capable of producing small quantities of biological agents.”⁴⁸ The statement was consistent with other U.S. statements regarding Libya and BW during the preceding decade. The phrasing in the 1993 report of the Russian Foreign Intelligence Service was substantially stronger, stating that “There is information that Libya is engaged in initial testing in the area of biological weapons.”⁴⁹ At the end of 2003, U.S. and UK government teams working in Libya ascertained that Libya had never had an offensive BW program. In the words of a U.S. administration briefer, “Libya acknowledged past intentions to acquire equipment and develop capabilities related to Biological Weapons.” Libya additionally “committed not to pursue a biological weapons program and to accept the necessary inspections and monitoring to verify that understanding.”⁵⁰ Apparently Libya may at some point have either procured or investigated the procurement of dual-use equipment that might have served such a program, information which had been picked up by intelligence. This experience demonstrates a weakness in judgments based on procurement monitoring. It can be a useful indicator, but it cannot be considered definitive.⁵¹

- It is now clear that under the pressure of UNSCOM inspections, the BW program of Iraq was disbanded between 1992 and 1995.⁵² Unfortunately, the Iraqi program provided two other lessons. First, as shown by the period 1985 to 1990, an offensive BW program can be hidden for quite a number of years, including during the period in which it initiates production. Second, as demonstrated in precisely the opposite direction by the period 1998 to 2002, the most basic errors in judgment can be made by Western intelligence agencies.⁵³ In addition, further public political manipulation of those mistaken judgments by political elites can take place.
- In 2004, the present U.S. administration also withdrew the charge that Cuba maintained an offensive BW program.⁵⁴
- Given the continued total denial by the Russian government of international access to the BW facilities of the Ministry of Defense of Russia (Kirov, Sergeiv Posad, and Yekaterinburg),

as well as continued impeded access to relevant facilities of the Ministry of Health, it is impossible to be certain of the status of BW-related activities in Russia. Nevertheless, they certainly are very greatly reduced from what they were up to 1991-92.

	U.S. Government Arms Control Compliance Reports to Congress (1993, 1995)	Admirals Brooks, Studeman, Trost ¹ (1988, 1990, 1991); Sec. Cheney, 1990	U.S. and UK Governments (1995)	Russian Federation ² Foreign Intelligence Report, 1993
Middle East				
Iraq	X	X		
Libya	X	X		X
Syria	X	X		
Iran	X	X		X
Egypt	X			
South/East Asia				
China	X	X		
North Korea		X		X
Taiwan	?	X		
India				?
South Korea				?
Africa				
South Africa			X	
Russia	Ambiguity regarding continuation of offensive program dating from the USSR			
<p>1: "Statement of Rear Admiral Thomas A. Brooks, USN, Director of Naval Intelligence, before the Seapower, Strategic, and Critical Materials Subcommittee of the House Armed Services Committee on Intelligence Issues," March 14, 1990, p. 54; "Statement of Rear Admiral William O. Studeman, USN, Director of Naval Intelligence, before the Seapower, Strategic, and Critical Materials Subcommittee of the House Armed Services Committee on Intelligence Issues," March 1, 1988, p. 48; "Statement of Admiral C. A. H. Trost, USN, Chief of Naval Operations, before the Senate Armed Services Committee on the Posture and Fiscal Year 1991 Budget of the United States Navy," February 28, 1990; "Remarks Prepared for Delivery by the Honorable Dick Cheney, Secretary of Defense, American Israel Public Affairs Committee, Washington, DC, June 11, 1990," News Release, No. 294-90, p. 4.</p> <p>2: <i>Proliferation Issues: A New Challenge After the Cold War, Proliferation of Weapons of Mass Destruction</i>, Russian Federation Foreign Intelligence Report (translation), JPRS-TND-9-3-007, March 5, 1993.</p>				

Table 1. Nations Having BW Programs at Least Approaching Weaponization.

This would mean an absolute reduction by four states — South Africa, Libya, Iraq, and Cuba — roughly one-third or one-fourth of the total number of states that, according to the U.S. Government, maintain offensive BW programs.

In addition, the status of several of the other national BW programs appears to be less certain than previously implied. If one looks at a recent public Central Intelligence Agency (CIA) assessment of the BW programs of Iran, North Korea, and Syria, it reads as follows:

Iran: Biological. Even though Iran is part of the BTWC, Tehran probably maintained an offensive BW program. Iran continued to seek dual-use biotechnical materials, equipment, and expertise that could be used in Tehran's BW program. Iran probably has the capability to produce at least small quantities of BW agents.

North Korea: Biological. North Korea has acceded to the BTWC but nonetheless has pursued BW capabilities since the 1960s. Pyongyang acquired dual-use biotechnical equipment, supplies, and reagents that could be used to support North Korea's BW program. North Korea is believed to possess a munitions production infrastructure that would have allowed it to weaponize BW agents and may have some such weapons available for use.

Syria. Chemical and Biological. Syria probably also continued to develop a BW capability.⁵⁵

A sentence on North Korea by CIA Director Porter Goss on March 17, 2005, was somewhat stronger: "We believe North Korea has active chemical weapons (CW) and BW programs and probably has chemical and possibly biological weapons ready for use."⁵⁶

By political agreement among the States Parties to the BTWC, Confidence Building Measures (CBM) were to be submitted annually, beginning in 1987. Iran did not submit any until 1998 and 1999, and when they did, they conveniently "forgot" to submit perhaps the two most critical CBM forms out of eight. These were the declarations that require the state to list national biological defense research and development programs (Form A2) and past activities in offensive/defense biological research and development programs (Form F). In 2002, Iran declared that it "did not and does not have any national, subnational or individual programs/activities and/or facilities related to biological offensive purposes" and that it "did

not and does not have any 'National Biological Defensive Program'. However the state has carried out some defensive studies on identification, decontamination, protection, and treatment against some agents and toxins."⁵⁷ Official U.S. statements regarding the Iranian BW program from 2001 onward reduced its apparent status compared to assessments that had been offered in the late 1990s. Reference to agent and weapon stocks disappeared. During President George W. Bush's first term, the administration submitted only one Arms Control Compliance report to Congress, although this report is intended by Congress to be an annual submission. It did this in its first year in office,⁵⁸ and there has not been another one since. It therefore remains to be seen how the Iranian BW program will be described in any forthcoming version.

It is useful to recall a statement in 1999 by Dr. John A. Lauder, then the Special Assistant to the Director of Central Intelligence for Nonproliferation:

Intelligence is all about ascertaining not only the capabilities, but also the intentions of one's adversaries. Because of the dual utility of the technology and expertise involved, the actual CBW threat is in fact directly tied to intentions. Getting at this intent is the hardest thing for intelligence to do, but it is essential if we are to determine with certainty the scope and nature of the global biological and chemical weapons threat.⁵⁹

U.S. Government officials have never explained what the word "capability" means in these statements: whether it means the procurement of dual-use biotechnology equipment, a national pharmaceutical production capacity, a dedicated defensive BW R&D program, or the identification of dedicated infrastructure for offensive BW R&D. It is clear however that after the Iraq weapons of mass destruction (WMD) intelligence failures demonstrated by the reports of the Iraq Survey Group, the U.S. administration decided to be much more cautious in the conclusions that it drew from perhaps rather ambiguous information.⁶⁰ Now and then over the previous years, one had overheard a comment by a government official or former government official to the effect that the evidence regarding country X or Y was ambiguous or weak. But that body of relevant evidence was never available for examination.⁶¹ In 2003, a WMD-wide review of U.S. assessments was initiated, and the review on the

proliferation of BW was headed by Lawrence Gershwin, National Intelligence Council officer for Science and Technology. This apparently led to the readjustment of some previous assessments.⁶²

In the case of Iran, an unusual opportunity was provided in 2003 by the presentation in Washington, DC, of detailed allegations regarding Iran's alleged BW program.⁶³ The information was provided by the same group that, in some cases, has been the first to provide information on Iran's nuclear weapon complex, information that had not been publicly known, nor apparently known by the International Atomic Energy Agency (IAEA), and which led to subsequent international action which forced Iranian government disclosures. The BW information was quite detailed, naming individuals, institutions, facilities, and locations. However, there has never been any comment or corroboration of these allegations by the U.S. Government or by any other government or international agency. In November 2004, CIA Director Goss reported to Congress that Iran continued "to vigorously pursue indigenous programs to produce nuclear, chemical and biological weapons." However, in March 2005, a special Presidential panel decried the state of knowledge available to the U.S. Government regarding even Iran's nuclear weapon program.⁶⁴ The U.S. Senate Select Committee on Intelligence is currently reviewing the information available to the administration regarding the nuclear, chemical, and biological programs of Iran and North Korea. It will be interesting to see if that report is made public, and, if so, what it will say in regard to the BW programs of these two countries.

The CIA document containing the assessments of the Iranian, North Korean, and Syrian BW programs quoted above is released twice a year. Although the analogous paragraphs of the preceding half-dozen or so years have not been included here for comparison, the above statements are all lower key than they were in earlier years in the same report. The caveats are notable: "probably," "continued to seek," "the capability to," "would have allowed it to," "probably also continued to develop." No definitive statements of production, stockpiling, or the nature of munitions are included.

As always, there is no discussion of Israel's BW "capability" or the status of its BW program in any public U.S. Government report. It is interesting to note, in regard to the comments on proliferation

that follow below, that in the only relevant data that appears to be available, Israel had the second largest number of visitors to the U.S. Army Medical Research Institute for Infectious Diseases (USAMRIID) following the UK, a country with which the United States shares BW relevant information.⁶⁵

We know that there was exaggeration of chemical weapon proliferation in the past, so this is not a unique experience. In 1990, Brad Roberts wrote “We entered the 1980s with three, four, or five chemically armed states; we will enter the 1990s with *upward of two dozen chemically armed states*” [my emphasis].⁶⁶ The estimate of the Director of the U.S. Arms Control and Disarmament Agency had been somewhat less, saying that “at least 15 states possessed chemical weapons, with others attempting to acquire them.” However, on January 24, 1989, his successor, General William Burns, told the U.S. Senate Foreign Relations Committee that only five or six of these countries actually possessed stockpiles of chemical weapons in addition to the U.S. and the Union of Soviet Socialist Republics (USSR).⁶⁷

In August 2005, the U.S. Department of State released its most recent version of its “Noncompliance” Report.⁶⁸ Although nominally an annual report, none had been released in 2004. Eight countries are discussed in the section dealing with the Biological and Toxin Weapons Convention. A sentence in the opening introductory paragraph of the section states that “the specific cases addressed here are those that have assumed obligations relevant to the BWC and for which the most evidence exists of actual or potential noncompliance.” The insertion of the word “potential” would seem to substantially undercut the utility of the entire section. A country should be considered in compliance with the BWC, or not in compliance. Libya is still included as one of the eight nations, although previous evidence presented by the current administration and discussed earlier would provide no reason for that. Cuba also is still present. The discussion of several countries was larded with caveats, explicit or implicit. Most problematic was the inclusion of general descriptors as suggestive evidence of noncompliance, such as work in “advanced biotechnology techniques,” “aerosolization techniques,” “legitimate public health and commercial uses [that]

could also offer access to . . . BW enabling capabilities,” “the technical capability to conduct limited offensive research,” the existence of facilities that “could easily hide . . . capabilities for a potential BW program.” All of these nonspecific indicators could equally apply to every NATO ally of the United States, every EU country, to many advanced developing nations, and above all, they would be more applicable to the United States than to any other country. They are not evidence of BWC treaty noncompliance. The use of such descriptors will almost certainly place previous U.S. attributions of BWC noncompliance in question in the minds of international diplomats who have regularly read the analogous BW sections in earlier annual U.S. Noncompliance reports. Finally, the 2005 report reinforces the conclusion that the trend of BW proliferation has not been increasing over the past decades, but that it has either been essentially constant or has been decreasing.

The possibility of proliferation from three of the former or present programs – South Africa, Iraq, and Russia – has been raised at times by commentators. What is known is as follows.

South Africa. The South African BW program was minimal, no more than a handful of researchers were involved. Contrary to various press reports in the media, the program did not include genetic engineering of pathogens, nor – as best is known – has there been any proliferation from the program whatsoever.⁶⁹

Iraq. There was no known emigration of researchers from the former BW program of Iraq. However, the Addendum to the report of the Iraq Survey Group released in March 2005 states that “Migration of some WMD-associated program personnel to countries like Iran or Syria is possible.” The phrasing is ambiguous in that it cannot be deciphered if this is assumed to already have happened, or if it is a generic statements suggesting that such migration could take place in the future. No disaggregation of “WMD” is provided. The report continues: “Since OIF [Operation IRAQI FREEDOM], the ISG [Iraq Survey Group] is aware of only one scientist associated with Iraq’s pre-1991 WMD program assisting terrorists or insurgents. However, there are multiple reports of Iraqis with general chemical or biological expertise helping insurgents produce chemical and biological agents.”⁷⁰ Nothing further is said about these “reports,” or whether the ISG considered them credible or not. Much more significantly,

the Addendum then discusses a list of Iraqi BW scientists prepared in early 2002 for the purpose of possible transmission to Syria. However, it was not known if the list was or was not ever transmitted to Syria, and the ISG did not discover any evidence of emigration of Iraqi BW scientists to Syria.

The *Twentieth Quarterly Report* of the United Nations Monitoring, Verification, and Inspection Commission (UNMOVIC) to the UN Security Council does raise the possibility that some of the pathogen cultures used for Iraq's BW production program may still remain unlocated in Iraq, a consideration that was also raised in the report of the U.S. Iraq Survey Group.⁷¹

Russia. Again, contrary to undocumented hints that find their way into media reports, there is no known evidence of the transfer of pathogens from the Soviet or continuing Russian programs to any other state, either prior to 1992 or since 1992. Emigration of former Soviet BW-related researchers to any proliferant state has been minimal. The one known example is the move of 10-12 researchers, largely from the institutes belonging to the Russian Academy of Sciences rather than from former BW institutes, to Iran. There continue to be statements, particularly by Dr. D. A. Henderson and the Pittsburgh group, to the effect that the location of Soviet BW "stockpiles" – not culture collections – produced in the USSR prior to 1990 are not known. U.S. intelligence and defense agencies have believed for over a decade that those "stockpiles" were destroyed by the USSR roughly between 1988 and 1990, and there are no indications that these agencies have ever altered that judgment. Contrary statements appear to be deliberately misleading.

As late as June 2005 at a seminar at the Council on Foreign Relations in New York City, Dr. Henderson said in reference to the possible dispersion of smallpox from the USSR or Russia:

There have been economic problems in the Soviet Union, or now Russia. Many of the scientists have left the laboratories. They've gone all over the world, different places, some in the United States, Europe, some have gone to North Korea, Iraq, Iran. So that [is what] the problem is, there is just no way of knowing who has what and where, and that's the concern, that there may be others with the virus, but we just can't find out about it.⁷²

No Soviet or Russian BW scientists are known by the U.S. intelligence community to have gone to North Korea or to Iraq. Those few Russian scientists that went to Iran did not come from institutes that worked with smallpox. The U.S. intelligence community does not believe that smallpox virus was transferred from the USSR or Russia to any other state, not the three mentioned nor any other. The great majority of Russian BW relevant scientists that emigrated did so to the United States, the UK, Germany, France, Australia, Sweden, Finland, Israel, etc., and not to states of BW proliferation concern.

PART III

EVOLUTION OF NONSTATE ACTOR/TERRORIST BIOLOGICAL WEAPONS CAPABILITIES

Five extensive databases were published in the 1990s covering nearly the entire 20th century, and several of these have been updated so as to remain current. It is extremely important to distinguish between the seven different categories of BW-related events that they cumulatively cover: hoaxes, threats, consideration or discussion of use, product tampering, purchase of materials, attacks on facilities, attempts to produce biological agents or attempts to use them, and actual use.⁷³

These databases were compiled by:

- Harvey McGeorge, 1994, covering 1945-94;⁷⁴
- Ron Purver, 1995, covering 1945-95;⁷⁵
- Bruce Hoffman, 1998, covering 1990-98;⁷⁶
- Seth Carus, 1999, covering 1990-99, and since updated;⁷⁷ and,
- The Monterey Institute, 1999, covering 1990-99, and since updated.⁷⁸

The conclusions from these independent studies were uniform and mutually reinforcing. There is an *extremely low* incidence of real biological (or chemical) events, in contrast to the number of hoaxes, the latter spawned by administration and media hype since 1996 concerning the prospective likelihood and dangers of such events. A massive second wave of hoaxes followed the anthrax incidents in the United States in October-November 2001, running into global totals of tens of thousands. It is also extremely important that analysts producing tables of “biological” events *not* count hoaxes. A hoax is not a “biological” event, nor is the word “anthrax” written on a slip of paper the same thing as anthrax, or a pathogen, or a “demonstration of threat” – all of which various analysts and even government advisory groups have counted hoaxes as being on one occasion or another.⁷⁹

Those events that were real, and were actual examples of use, were overwhelmingly chemical, and even in that category, involved the use of easily available, off-the-shelf, nonsynthesized industrial products. Many of these were instances of personal murder, and not attempts at mass casualty use. The Sands/Monterey compilation indicated that exactly one person was killed in the United States in the 100 years between 1900 and 2000 as a result of an act of biological or chemical terrorism.

Excluding the preparation of ricin, a plant toxin that is relatively easier to prepare, there are only a few recorded instances in the years 1900 to 2000 of the preparation or attempted preparation of pathogens in a private laboratory by a nonstate actor.

The significant events to date are:

- 1984, the Rajneesh, The Dalles, Oregon, use of salmonella on food;
- 1990-94, the Japanese Aum Shinrikyo group's unsuccessful attempts to procure, produce and disperse anthrax and botulinum toxin;⁸⁰
- 1999, November 2001, al-Qaida,⁸¹ the unsuccessful early efforts to obtain anthrax and to prepare a facility in which to do microbiological work;
- October-November 2001, the successful "Amerithrax" distribution of a high-quality dry-powder preparation of anthrax spores, which had been prepared within the preceding 24 months.

Before discussing the Amerithrax and al-Qaida experiences in some further detail, two books, one published and one still in press, should be mentioned. These are particularly important because they are collections of case studies which, between the two, contain detailed reviews of virtually all the groups or individuals who have – or who had been alleged to have – prepared or used chemical or biological agents. The first of the books is *Toxic Terror*, edited by Jonathan Tucker,⁸² and the second is the forthcoming *Motives, Means and Mayhem: Terrorist Acquisition and Use of Unconventional Weapons*, edited by John Parachini.⁸³ Between them the two books report on 28 case studies. They demonstrate that several right-wing groups in

the United States produced ricin by extraction from mashed castor bean pulp, and that the Rajneesh group did culture the salmonella that it obtained. However, there is apparently no other “terrorist” group that is known to have successfully cultured any pathogen. It is precisely because of the exceptional nature of the Amerithrax case that it becomes crucially significant to identify the person or persons who made the U.S. anthrax preparation, and to determine whether that is the same individual or individuals who prepared and mailed the postal envelopes. We will return to this in a moment.

In advance of the publication of his book, Parachini summarized the conclusions from those studies that “provide an empirical foundation to assess the motivations, behavior, and patterns related to terrorist interest, or alleged interest, in unconventional weapons.”⁸⁴ Perhaps the most important discovery from the first of the two books was that “Upon rigorous inspection, several of the empirical cases frequently cited in the media and scholarly literature proved to be apocryphal.” Parachini then discusses several factors that appear to be most significant in understanding the case studies. He finds the mindset of the group leaders of the organization, exogenous and internal constraints, and a combination of opportunity and the technical capacity of the group to be “. . . the factors that most significantly influence a group’s propensity to seek to acquire and to use unconventional weapons.” These conclusions are consistent with those made by another highly experienced terrorism specialist, Dr. Yoram Schweitzer of the Jaffee Center for Strategic Studies, Tel Aviv University. In a recent conference presentation, he enumerated four factors which he felt served as inhibitions to the consideration of biological weapons within terrorist organizations: state dependency, requirements of their own local constituency, requirements of the international constituency, and group survival.⁸⁵

To the degree that the leadership of a particular terrorist organization does not have or escapes from these considerations, they may consider the use of biological agents more seriously. This may explain why the experience of the Rajneesh, Aum Shinrikyo, and al-Qaida groups followed a path different from other terrorist groups. Similar conceptions were explored as far back as 1989 in a RAND study authored by Dr. Jeffrey Simon.⁸⁶ This sort of analysis

of real cases of the relevant behavior of real terrorist groups, carried out by experienced analysts of terrorism, when it is not disregarded entirely, is frequently met with disdain by the proselytizers of “the bioterrorist threat,” as an example presented later in this monograph indicates.

The extremely brief entry regarding terrorist groups and BW and CW capabilities that appeared in the December 2004 report of the U.S. National Intelligence Council was again minimalist in its description:

Developments in CW and BW agents and the proliferation of related expertise will pose a substantial threat, particularly from terrorists, as we have noted.

- Given the goal of some terrorist groups to use weapons that can be employed surreptitiously and generate dramatic impact, we expect to see terrorist use of some readily available biological and chemical weapons.⁸⁷

Since this is a report that was looking ahead to the period between 2005 and 2020 – the next 15 years – the reference to “readily available” materials is particularly notable. It harks back to the conclusions of the 20th century database studies, and certainly does not seem to anticipate efforts at synthesis, genetic engineering, or anything beyond the most elementary products. Dr. Stephen Morse predicted much the same speaking to a day-long conference convened by the U.S. National Academy of Sciences in January 2003. Morse previously served in the Defense Advanced Research Projects Agency (DARPA) of the U.S. Department of Defense (DoD), and currently is director of the Center for Public Health Preparedness at Columbia University’s School of Public Health. In answering his own question “What sources would terrorists use,” he stated that “Most are likely to use easily obtained materials,” and that “state-sponsored [terrorists] might use ‘classical BW’.”⁸⁸

The latest U.S. Government intelligence estimates of the BW capabilities of terrorist/nonstate actor groups became available in February and March 2005. They first appeared in three presentations to the U.S. Senate Select Committee on Intelligence on February 16, 2005.

Porter Goss, Director of Central Intelligence: "It may be only a matter of time before al-Qaida or another group attempts to use chemical, biological, radiological, and nuclear weapons (CBRN)."

Robert Mueller, Director of the Federal Bureau of Investigation: ". . . we are concerned that they are seeking weapons of mass destruction including chemical weapons, so-called 'dirty bombs' or some type of biological agent such as anthrax. . . . I am also very concerned with the growing body of sensitive reporting that continues to show al-Qaida's clear intention to obtain and ultimately use some form of chemical, biological, nuclear or high-energy explosives (CBRNE) material in its attacks against America."

Jim Loy, Deputy Secretary, U.S. Department of Homeland Security: ". . . the most severe threats revolve around al-Qaida and its affiliates' long-standing intention to develop, procure, or acquire chemical, biological, radiological, and even nuclear, weapons for mass-casualty attacks. Al-Qaida and affiliated elements currently have the capability to produce small amounts of crude biological toxins and toxic chemical materials, and may have acquired small amounts of radioactive materials."⁸⁹

On March 17, 2005, it was the turn of Vice Admiral Jacoby, Director of the U.S. Defense Intelligence Agency, in a presentation to the U.S. Senate Armed Services Committee:

We judge terrorist groups, particularly al-Qaida, [to] remain interested in Chemical, Biological, Radiological and Nuclear (CBRN) weapons. Al-Qaida's stated intention to conduct an attack exceeding the destruction of 9/11 raises the possibility that planned attacks may involve unconventional weapons. There is little doubt it has contemplated using radiological or nuclear material. The question is whether al-Qaida has the capability. Because they are easier to employ, we believe terrorists are more likely to use biological agents such as ricin or botulinum toxin or toxic industrial chemicals to cause casualties and attack the psyche of the targeted populations.⁹⁰

CIA Director Porter Goss made a presentation to the Committee as well, and repeated the exact wording of his February 16 remarks quoted above.

These rather similar extracts are the only references to nonstate actor interest or capability in the CBW area in all the presentations.

They are significant for several reasons:

- No other group than al-Qaida was mentioned.
- All of the statements are less specific, more general, lower key, than in the preceding (Tenet) years.
- In two of the three statements, B is grouped together with C, R and N, and in one even with "E" (high-energy explosives), making it impossible for someone without prior knowledge to know whether there is a specific basis for including B.
- One of the statements refers to "small amounts of crude biological toxins" which undoubtedly refers to ricin and not to any pathogen.
- It has been known at least since November 2001, when U.S. and UK military forces occupied Afghanistan, that al-Qaida had been "seeking . . . anthrax" for 2 or 3 years prior to that date. The information therefore concerns al-Qaida activities before the fall of Afghanistan, and there is no publicly available information to indicate that the group has been able to continue their efforts since the end of 2001.

Anthrax is endemic in Afghanistan, and a limited domestic animal vaccination program existed in the country. Nevertheless, there were undoubtedly some number of animal cases of the disease per year, but the group apparently never obtained a pathogenic strain.

In addition, all of the four recent specific references to al-Qaida-affiliated groups and ricin have turned out to be spurious. When the Al Ansar camp in Northeast Iraq, "Kermal," was overrun by U.S. military forces, sampling showed no presence whatsoever of ricin, nor of materials for its preparation. (In fact, the camp lacked running water.) Before the invasion, there had been several statements by U.S. Government and military officials stating that the group was preparing ricin in the camp. As late as the Vice Presidential debate on October 5, 2004, U.S. Vice President Cheney, referring to Abu Musab al-Zarqawi, said, "He set up shop in Baghdad, where he oversaw the poisons facility up at Kermal, where the terrorists were developing ricin and other deadly substances to use."⁹¹ Since this remark was made long after the U.S. Government knew that the camp had

contained no ricin, Cheney's statement has to be considered either ignorance or fabrication. There is no mention whatsoever of the Al Ansar camp in the report of the Iraq Survey Group.

Individuals arrested by French police did not have any ricin nor had they prepared any; they had only "planned to" produce ricin. The "chemicals" that the group had was apparently sodium cyanide.

The "plots" in the spring of 2003 by a group associated with Abu Musab Zarqawi in Jordan reportedly again involved sodium cyanide, and not ricin. (Since Jordanian authorities have referred to the planned use of 20 tons of high explosives in the planned event, there is every reason to assume that the cyanide would have been destroyed in any such massive high explosives blast.)

The London case is the last, and it is interesting to look at it in some detail. The group, arrested in Wood Green, London, was in possession of 22 castor bean seeds. Their equipment was a coffee grinder, ". . . with a brown residue" (probably of coffee), a mortar and pestle, and a hand-written recipe taken off the internet at an internet café and transcribed into Arabic. The recipe was a derivative of the Maxwell Hutchkinson recipe in the notorious *The Poisoner's Handbook* sold in thousands of copies at U.S. gun shows, a recipe that would very likely not produce ricin or extremely little of it.

The first tests for ricin in the London apartment were done by a field test kit and apparently registered positive. Within 2 days, 20 more specific tests were carried out at the British Defense Science Technology Laboratory, Porton Down, resulting in 17 "negatives" and three false positives. However the task of informing the London Metropolitan Police fell to another Porton staffer with public liaison responsibilities, who apparently either did not understand or confused the information that he was to relay, with the result that he phoned the press and police, saying that "traces of ricin" had been found.⁹² His actions were later attributed to "incompetence." Despite this, as late as mid-February 2005, an official UN investigative group reported to the UN Security Council that "al-Qaida-associated groups in both the United Kingdom and Jordan came close to mounting such [C, B, R, or N] attacks. It seems only a matter of time before a successful chemical, biological, radiological and nuclear attack occurs." (All four at once!)⁹³ All of the above is incorrect. No ricin was

found. Whether the UK Metropolitan Police ever announced a public correction in 2003 is not known. It is unfortunate that misinformation of this sort found its way into a UN document.

Scientists at Porton Down subsequently followed the Hutchkinson recipe as an experiment. It produced sufficient ricin to kill one person if the total quantity would have been *injected* into a person. If eaten, it was sufficient to have caused vomiting and abdominal pain. If applied to doorknobs to act as a contact poison, it would have had no effect at all.⁹⁴ Three other “recipes” were found with this ricin “recipe”: a “rotten meat poison” to be prepared by mixing “corn flour, meat, dung, and dust together in a can,” a “recipe” for “cyanide poison” to be obtained by boiling many thousands of ground apple seeds, and a “potato poison” of equal inutility.⁹⁵ However, Peter Clarke, the head of Britain’s antiterrorist police branch, described the poison plot as being “highly serious,” while Nigel Sweeney, the prosecutor, said “These were no playtime recipes. These are recipes that experts give credence to and experiments show work. They are scientifically viable and potentially deadly.”⁹⁶ Both statements are clearly wrong, and there is no reason that law enforcement officials anywhere in the world should be able to do their work without inaccurate and sensationalist comments.

As for the “Encyclopedia of Jihad,” in which such rudimentary and often inadequate recipes are supposedly located, it is not clear when it was composed. One suggestion is that its origin goes back to the 1978-88 period of Afghan resistance to the USSR, which would be as much as 10 years before al-Qaida came into existence. A second suggestion is that it is an agglomeration that grew over the years, with material successively added to it, materials on toxin production being added in later years. Although the “Encyclopedia” is routinely attributed to al-Qaida, it therefore may rather have been inherited, or adopted, by the group.

Al-Qaida BW Efforts in Afghanistan: 1997-98 to 2001.

When we move to the al-Qaida group in Afghanistan, the picture rapidly becomes much more serious, and all the preceding semi-farcical events can be seen as inconsequential trivia. The first significant and meaningful information on what al-Qaida may have

hoped at some point to achieve in the area of BW appeared in a single page in the journal *Science* in mid-December 2003,⁹⁷ and then in declassified documentary materials that were obtained in the last week of March 2004. Appended to the single page in *Science* by a computer link was a list of 32 items: 11 books and 21 professional journal papers nearly all dating from the 1950s and 1960s dealing with pathogens or with BW. These were found in an al-Qaida training camp near Kandahar, Afghanistan, in December 2001.⁹⁸ Half of the books dealt with historical or general aspects of BW and would be of little operational utility to an effort to produce BW agents. However, at least some of the journal papers and the remaining half of the books could be useful for such an effort. A note in the *Science* paper identified these as the documents referred to by CIA Director Tenet in his February 2002 Senate testimony quoted below. They were found only a few kilometers from the site near Kandahar airport which contained the rudimentary equipment also procured by al-Qaida.

Most important of all, the documents indicated that "... al-Qaida's BW initiative included recruitment of individuals with Ph.D.-level expertise who supported planning and acquisition efforts by their familiarity with the scientific community." The journal papers concerned *B. anthracis* and *Clostridium botulinum*, but also *Yersinia pestis* (plague) and Hepatitis A and C. Fragments of two of the classified materials were included in the *Science* article as photocopies of handwritten letters. The letterhead of one of them read "Society for Applied Microbiology." The second item reports that the individual was not able to obtain a pathogenic culture of anthrax, and that "the culture available in [deleted] is nonpathogenic." The webpage of the Society for Applied Microbiology advertises that organization as "the UK's oldest microbiological society." Another snippet from the handwritten letter, which explained that its author would "require at least the air ticket expenses," indicated that the person was flying either to or from the UK. The letter fragment also explained that "The money with me is only to buy strains of vaccines."

When the classified documents were obtained, it turned out that nearly all of the pages consisted of the journal articles themselves, as well as medical handbook excerpts on anthrax, plague, botulinum,

etc.⁹⁹ There were also many additional pages of references to both books and journals, including many standard reference works such as the SIPRI volumes on *The Problems of Chemical and Biological Warfare* and the 1969 UN study on chemical and biological weapons. It was the remaining 10 pages that were of importance. They were two 3-page letters and accompanying handwritten notes suggesting the layout of a laboratory and the equipment recommended to outfit it, and “program requirements” including the time needed to train whoever was going to work in the laboratory, and that person’s assistants.

The correspondent already had a Ph.D. It is clear that the author of the letter was not a native English speaker, and annotations on some of the papers that he sent from England were in Arabic. Yet the letters and the accompanying notes were written in English. It suggested that either English was the only language that he and the recipient shared in common, or it was the preferred language for them to use with each other. In fact, the author was a Pakistani microbiologist, whose native language would be Dari, and there is reason to believe that he was writing to the Egyptian, Dr. al-Zawahiri, Osama bin Laden’s deputy. The writer reports visiting a BL-3 facility – apparently in the UK – at which time he had been shown a pathogen collection. He was not only trying to obtain and export pathogen cultures, but he was also seeking to buy vaccines for protecting personnel against anthrax infection. He was being supplied by al-Qaida with funds with which to buy equipment and materials, which he itemized. He had also been attending various European conferences dealing with pathogens – or had obtained their proceedings – including a conference on anthrax. The latest dates of these were in July and September 1999. He had signed his letters, named the laboratory that he had visited, and named its laboratory director and identified one or two other individuals by name. All these identifications were deleted in the declassified materials.

What the documents indicated was an individual with Ph.D.-level training, who understood the professional microbiology literature, and who understood professional procedures for purchasing pathogen cultures. He was willing to trade on the access provided by his status, while concealing the true purpose of his activities, which was to provide al-Qaida with the means to attempt its first

real BW production capability. However, he was *not* prepared to do any of the laboratory work himself. There is no evidence in any of the declassified pages to indicate that any bacterial cultures had yet been obtained, or that any had been shipped to Afghanistan or Pakistan, or that any work had yet begun. In fact, all the phrasing on these pages suggests that none of these things had yet occurred. There is also no mention of the procurement of bacterial culture media that would be necessary to have in hand before any work could begin.

These materials were characterized by various senior U.S. officials in 2002 and 2003. On February 25, 2002, General Tommy R. Franks, the commander of U.S. military forces in Afghanistan, reported that following the examination of over 110 sites in Afghanistan:

. . . the United States has yet to find evidence that al-Qaida was able to create a chemical or biological weapon at any of its camps, command centers, or caves in Afghanistan . . . We have seen evidence that al-Qaida had a desire to weaponize chemical and biological capability, but we have not yet found evidence that indicates that they were able to do so.¹⁰⁰

Similarly in February 2002, U.S. CIA Director Tenet stated:

. . . we know that al-Qaida was working to acquire some of the most dangerous chemical agents and toxins. Documents recovered from al-Qaida facilities in Afghanistan show that Bin Laden was pursuing a *sophisticated biological weapons research program*.¹⁰¹

In his analogous “Threats” assessment in 2003, Tenet told the U.S. Senate Committee on Armed Services, “I told you last year . . . that bin Laden has a sophisticated biological weapons capability. . . . In Afghanistan, al-Qaida succeeded in acquiring both the expertise and equipment needed to grow biological agents, including a dedicated laboratory in an isolated compound in Kandahar.”¹⁰²

The inclusion of the words “pursuing” and “research program” in 2002 arguably makes the statement factually correct. “Pursuing” is not the same as saying that al-Qaida had produced any usable product. However, Tenet’s 2003 language is substantially different and implies much more, stating that al-Qaida “*has a sophisticated biological weapons capability*” [emphasis added]. Nevertheless, the declassified materials permitted some proper understanding for the

first time of the basis for statements by U.S. Government officials that the status of al-Qaida's BW program might be more advanced than had been anticipated.

The relevant passages in the annual CIA and Defense Intelligence Agency (DIA) threat assessment presentations to the U.S. Senate in February 2004 also very likely reflected judgments based on the materials described above. From the Director of the DIA:

Al-Qaida and other terrorist groups remain interested in acquiring Chemical, Biological, Radiological, and Nuclear (CBRN) weapons. We remain concerned about rogue scientists and the potential that state actors are providing, or will provide, technological assistance to terrorist organizations. . . . While we have no intelligence suggesting states are planning to give terrorist groups these weapons, we remain concerned about, and alert to, the possibility.¹⁰³

And from the Director of the CIA:

. . . I have consistently warned this committee of al-Qaida's interest in chemical, biological, radiological, and nuclear weapons. Acquiring these remains a "religious obligation" in Bin Ladin's eyes, and al-Qaida and more than two dozen other terrorist groups are pursuing CBRN materials. . . . Although gaps in our understanding remain, we see al-Qaida's program to produce anthrax as one of the most immediate terrorist CBRN threats we are likely face.¹⁰⁴

The report of the U.S. September 11, 2001 (9/11) Commission includes a bare few lines on the single individual identified to date, a Malaysian, who was to have carried out al-Qaida's laboratory work:

In 2001, [Yazid] Sufaat would spend several months attempting to cultivate anthrax for al-Qaida in a laboratory he helped set up near the Kandahar airport. . . . Sufaat did not start on the al-Qaida biological weapons program until after the JI's [Jemaah Islamiah] December 2000 Church bombings in Indonesia, in which he was involved.¹⁰⁵

Yazid Sufaat was arrested in Malaysia in December 2001. Publicly available information about him has come from two important al-Qaida sources. The first was Khaled Sheikh Mohammed who was arrested on March 1, 2003, in Rawalpindi, Pakistan, at the home

of a fugitive Pakistani bacteriologist, Dr. Abdul-Quddis Khan. Handwritten notes and computer hard drives were seized in the home, showing, according to a reporter's description, that al-Qaida had ". . . completed plans and obtained the materials required to manufacture two biological toxins—botulinum and salmonella—and the chemical poison cyanide."¹⁰⁶ Cyanide would not be "manufactured," and it is ambiguous if the "materials required" were the pathogen cultures, the bacterial growth media, equipment needed, or which of the above. "Plans" does not indicate that any production took place. The press report of these discoveries was contradictory in places, but claimed that the recruitment of named scientists was discussed in the materials seized, production steps were outlined, and equipment, such as that found in Afghanistan, was described. Among items found was "a direction to purchase" *Bacillus anthracis*. Nothing so far translated indicated access to the most dangerous microbial strains or to any advanced processing or delivery methods.

Mohammed also told his interrogators that Sufaat ". . . took the lead in developing biological weapons for al-Qaida until he was arrested by Malaysian authorities."¹⁰⁷ Sufaat reportedly obtained a Bachelors degree "in biological sciences," with a "clinical laboratory concentration" from California State University in Sacramento in 1987. He then served as a laboratory technician in the Malaysian military and in 1993 established a company in Malaysia "to test the blood and urine of foreign workers and state employees for drug use."¹⁰⁸ In the course of recent years, his company, and possibly another owned by his wife, appear to have been involved in financial transfers and the purchase of ammonium nitrate for producing explosives on behalf of groups affiliated with al-Qaida operating in Indonesia, Malaysia, and the Philippines. The suggestion that Sufaat was not able to procure an appropriate strain of anthrax for use as a pathogen demonstrates the same difficulty faced by the Aum Shinrikyo group in Japan, which was only able to obtain the veterinary vaccine strain of anthrax. This appears to have been corroborated by reports in October 2003.¹⁰⁹ A photograph taken at an internationally supported animal vaccine production facility outside of Kabul by an Associated Press photographer in November 2001 showed a large glass carboy jar labeled "Anthrax spore Concentration." It almost certainly

contained Sterne strain anthrax vaccine. While incriminating as to al-Qaida's eventual intentions, all information to date indicates that al-Qaida could not possibly have been responsible for the anthrax attacks in the United States in 2001.

Additional reporting about Yazid Sufaat came from Hambali (Raduan Isamuddin), the Indonesian operative of the al-Qaida affiliated organization, Jemaah Islamiah, who was responsible for the Bali bombing attack in August 2003. After his capture, Hambali told his interrogators that he had earlier been collaborating with Sufaat, that he had been "trying to open an al-Qaida bio-weapons branch plant," and that Sufaat had been "working on an al-Qaida anthrax program in Kandahar," in Afghanistan, but that after the U.S. attack on the Taliban, they had planned to move the "program" to Indonesia. However, Sufaat had been unable to obtain a pathogenic strain of anthrax.¹¹⁰ In another report, U.S. and Malaysian security officials more accurately described the al-Qaida program to develop biological and chemical weapons as having been "in the early 'conceptual stage' when it was cut short by the U.S. invasion of Afghanistan."¹¹¹ CBS nevertheless reported this as "al-Qaida may be hard at work trying to produce weaponized anthrax and other biological weapons." Two weeks later, rumors that Jemmah Islamiah branches in the Philippines were producing biological or chemical agents were quickly proved to be spurious.¹¹²

An important question is how much and what kind of actual laboratory work Sufaat might have been able to achieve in the "several months" available to him at the Kandahar site. Sufaat and Hambali apparently made four trips between Kandahar and Karachi to purchase materials.¹¹³ The 1,000+ kilometer distance each way means that these trips would have been by air, but nevertheless could have together required several weeks to a month. Other lower-ranking al-Qaida members also made purchasing trips to Pakistan. As best is known, the Kandahar site appears not to have yet been functioning, and may have contained little equipment aside from an autoclave.

In addition to the declassified documentation found in Kandahar, information obtained through the interrogations of K. S. Mohammed, Hambali, and possibly some others at Guantanamo, Cuba, there was

yet one more source of information that was obtained from within al-Qaida regarding its interest in biological weapons. Additional fragments of information found at the end of 2001 on computer discs that appear to have belonged to Dr. Ayman al-Zawahiri provide little confidence in the competence of the al-Qaida group to carry out either chemical or biological agent production. If anything, they detract from assumptions of capability, although they apparently date from early in their efforts. The initial program investment was either \$2,000 or \$2,000 to \$4,000, and, after several months, Dr. al-Zawahiri considered it to have been “wasted effort and money.” The group at that time seemed quite constrained in economic resources as well as in applicable talent, and did not at all appear to have the kinds of financial resources available to the Japanese Aum Shinrikyo group. This early effort appears to have been intended to produce a “nerve gas” from a commercial agricultural insecticide. Perhaps the most important information in an al Zawahiri memorandum of April 15, 1999, is contained in the following sentences:

... we only became aware of them [biological weapons] when the enemy drew our attention to them by repeatedly expressing concerns that they can be produced simply with easily available materials. . . .

I would like to emphasize what we previously discussed—that looking for a specialist is the fastest, safest, and cheapest way [to embark on a biological and chemical weapons program].¹¹⁴

Other information indicates that Al-Zawahiri’s remark about “the enemy drew our attention to them” refers to U.S. Secretary of Defense William Cohen’s November 1997 national television appearance, which included greatly exaggerated prediction of what his 5-pound bag of sugar standing in for anthrax could achieve if dispersed over Washington, DC.¹¹⁵

Early in March 2005, a press item returned to the material found on a computer disc when K.S. Mohammed was captured, and the sentence quoted earlier from the 2003 *Washington Post* story: “. . . [al-Qaida] obtained the materials required to manufacture two biological toxins—botulinum and salmonella—and the chemical poison cyanide. They are also close to a feasible production plan

for anthrax.”¹¹⁶ This information was attributed to “U.S. intelligence services quoted in the U.S. media.” This can only refer to the general and ambiguous statement by senior U.S. intelligence officials quoted previously. As indicated, the cyanide information dates back to 1998. “Managed to obtain material necessary to make” does not indicate that anything was made, or even that *all* materials necessary – such as the pathogen – had been obtained. The very next day, an editorial in the *Washington Post* stated, “This country has already experienced one anthrax attack. Security officials have repeatedly stated their belief that al-Qaida and others continue to search for more lethal bioweapons.”¹¹⁷ The “others” referred to by Tenet in February 2004 claimed their interest in “CBRN” not specifically “bioweapons.” And there are no identifiable public statements by U.S. “security officials” saying that “al-Qaida and others” were searching “for more lethal bioweapons” than anthrax. It is possible that the “security officials” that *Washington Post* editors had in mind came from another press comment during a March 1, 2005, Interpol conference: “Security officials have long worried of the risk of an al-Qaida attack using biological weapons such as anthrax, ricin, botulinum toxin, smallpox, plague, or Ebola.”¹¹⁸ There are no identifiable statements by any “security official” warning of the potential use by al-Qaida of smallpox or Ebola, and the suggestion is highly implausible.

On March 31, 2005, the *Report of the Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction* became available. The information that it contained concerning the status of al-Qaida and BW was vastly different from the brief paragraph in the report of the 9/11 Commission.

The Intelligence Community concluded that at the time of the commencement of the war in Afghanistan, al-Qaida’s biological weapons program was both more advanced and more sophisticated than analysts had previously assessed.

. . . al-Qaida’s biological program was further along, particularly with regard to Agent X, than prewar intelligence indicated. The program was extensive, well-organized, and operated for 2 years before September 11, but intelligence insights into the program were limited. The program involved several sites in Afghanistan. Two of these sites contained commercial equipment and were operated by individuals with special training. Documents found indicated that while al-Qaida’s primary

interest was Agent X, the group had considered acquiring a variety of other biological agents. The documents obtained at the training camp included scientific articles and handwritten notes pertaining to Agent X.

Reporting supports the hypothesis that al-Qaida had acquired several biological agents possibly as early as 1999, and had the necessary equipment to enable limited, basic production of Agent X. Other reporting indicates that al-Qaida had succeeded in isolating cultures of Agent X. Nevertheless, outstanding questions remain about the extent of biological research and development in pre-war Afghanistan, including about the reliability of the reporting described above.¹¹⁹

The sources for the Commission's remarks all refer to classified reports. The two Presidential Commissions appear to have used different procedures to obtain documents for examination, and one suggestion is that, as a result, they did not, in all cases, obtain the same documentation for review.¹²⁰ Of course, if the hard information prior to the coalition invasion of Afghanistan regarding al-Qaida and BW was nil, then their efforts will certainly appear "more advanced and more sophisticated" than was previously understood once the actual information in the now declassified documents was found. Is it possible to make any further guesses regarding the substance of the Commission's phrasing?

The information in the "documents obtained at the training camp" and "the handwritten notes" have just been explained in detail in the preceding pages, and concern anthrax, botulinum toxin, plague, and Hepatitis A and C. Hepatitis viruses are extremely difficult to work with, even for professional virologists. They require cell culture technology, but could in theory be used to contaminate food and water. The most recent U.S. intelligence statements quoted earlier refer more often to botulinum toxin than they do to anthrax. Nevertheless, "Agent X" almost certainly refers to anthrax, with botulinum toxin the most plausible second guess. The key question regarding the information quoted above is whether there is additional documentary or material evidence to support it beyond that already obtained in the papers found in November 2001 and the locations occupied at that time.¹²¹ Those did not indicate success "in isolating cultures of Agent X." And only the Sterne vaccine strain had been available to the group in Afghanistan. The statement that much of

the Commission’s brief summation was a “hypothesis” dependent on “reporting,” at the same time as there remain “outstanding questions . . . including about the reliability of the reporting described above,” seems to leave much of it an open question and possibly adds nothing of substance to what was already known from the declassified documents.¹²² Nevertheless, the reference to two sites containing “commercial equipment” may suggest additional al-Qaida efforts beyond those disclosed in the declassified documents and related information so far available to the author.

A member of the Presidential Intelligence Commission was asked if he thought that one should be any less skeptical regarding the intelligence concerning al-Qaida BW activities in Afghanistan than the allegations that had been made by the U.S. administration regarding the status of Iraq’s BW program in the years between 1995 and 2002. He replied that one should not be any less skeptical regarding the intelligence about al-Qaida’s BW capabilities.¹²³

	Number of Professionally Trained Individuals	Total Number of individuals	Duration of Effort and Status of Program	Access to Pathogens	Acquisition of Equipment	Acquisition of Information	Funds Expended
Aum Shinrikyo	2-3	~10-12	1990-1994, including laboratory work	None: attempt to obtain failed	Adequate	“300 books”	? (Estimate of around \$10 million)
al-Qaida	1 or 2 (?) plus “consultants” and purchasing assistants. The possibility of others is unknown.	Unknown	1998 (?) to 2001, laboratory work apparently had not yet begun	Apparently none: attempt to obtain anthrax reportedly failed	Minimal, but precise dimensions unknown	12 books, 20 academic journal papers plus additional references	Not known

Table 2. Comparison of BW Efforts by the Aum Shinrikyo and al-Qaida.

Pakistani press reports indicate that the Pakistani microbiologist who had assisted al-Qaida in information gathering, as well as an alleged “Yemeni . . . studying microbiology at the University of Karachi” were arrested in October 2001. If this is the case, with the facility overrun by U.S. forces in December 2001, Sufaat also arrested in December 2001, and the two above individuals arrested in October 2001, even before US/UK forces had found the documentation in

Kandahar, it would appear that the al-Qaida BW program may have been dismantled at the end of 2001. The location of Dr. Khan, in whose home K. S. Mohammed was captured, is known to the Pakistani government. He is incapacitated and is therefore reportedly not a factor of concern. Whether other dispersed individuals of the group have any available work sites for microbiology in any other location is unknown. The statement by French Interior Minister Dominique de Villepin at Interpol's First World Conference on Bioterrorism in Lyon, France, on March 2, 2005, claiming that ". . . after al-Qaida groups were smashed in Afghanistan, international terrorist groups were still working on chemical and germ weapons in Georgia's Pankisi Gorge" seems highly implausible insofar as it refers to "germ weapons."¹²⁴ Al-Qaida elements in the Pankisi Gorge had reportedly been killed, captured, or dispersed by a joint U.S.-Georgian special operation in 2002. In contrast to the French statement, Major General Eric Olson, the second ranking U.S. military officer in Afghanistan, told the Associated Press on February 25, 2005, that he had no indications that al-Qaida was attempting to obtain nuclear or biological weapons, that there was "no evidence that they're trying to acquire a terrorist weapon of that type."¹²⁵

The three terrorist groups that have been innovative in their methods have one aspect in common: the Tamil Elam in Sri Lanka, the Japanese Aum Shinrikyo, and the al-Qaida organization have all actively recruited among educated, college graduates, and specifically sought individuals with particular knowledge and training. (The Tamil Elam showed no interest in BW, and in only one anomalous incident used industrial canisters of chlorine gas.) K. S. Mohammed completed a degree at a U.S. college, as did Yazid Sufaat. An unclassified summary of information on detainees at Guantanamo states that "More than 10 percent of the detainees possess college degrees or obtained other higher education, often at Western colleges, many in the United States. Among these educated detainees are medical doctors, airplane pilots, aviation specialists, engineers, divers, translators, and lawyers."¹²⁶ At least one holds a degree in electrical engineering, another holds a graduate degree in aviation management, and a third holds a masters degree in petroleum engineering. Such recruiting patterns do not automatically translate

into either interest or capability in BW, but they would be a key advantage should the interests of such a group turn in that direction, as Dr. al Zawahiri's memorandum quoted earlier indicates.

The reports of the UN Special Commission (UNSCOM) and that of the U.S. CIA's Iraq Survey Group (ISG) provide valuable insights into what one might expect of the initial efforts by a terrorist group. The report of the ISG describes the initial *failures* of the Iraqi *national CW* program to produce a chemical weapon between 1971 and 1978.¹²⁷ The information provided does not clarify if the impediments were in the industrial synthesis of chemical agents or in their weaponization. Nevertheless, this involved a *state* program, state resources, and a period of 8 years. It was previously known from UNSCOM reports that the same failure occurred in the Iraqi BW program in the "early 1970's," and again between 1974 and 1978. The ISG report also provides information on two efforts made by insurgent groups inside Iraq in 2002-03 to produce very basic chemical weapon agents. Although the services of several chemists were obtained to produce the agents, both these efforts failed.¹²⁸ It is uniformly assumed that the production of classical chemical weapon agents as well as their dissemination is simpler than that of classical biological weapon agents.

All of the preceding explains the crucial significance of establishing precisely who was the perpetrator of the 2001 anthrax incidents in the United States, and how and where the anthrax preparation was produced. It is the sole outlier event. Without it, and except for the Rajneesh salmonella incident, there would still be no evidence of capability on the part of a nonstate actor to produce a biological agent. There has also been no evidence to date of the provision of assistance by a state to a nonstate actor to produce biological agents.¹²⁹ If it should turn out, as is currently assumed, that the Amerithrax perpetrator came from within the U.S. Government's own biodefense program, with access to strains, laboratories, people, and knowledge, then all the conceptions about the significance of the events get substantially altered. It does *not* alter the fact that it can be done, and that the preparation could have been dispersed in a much more harmful way. But it does affect the crucial question of "By Whom"?—and the projections imputed to traditional "terrorist" groups.¹³⁰ With this

exception, all attempts by other groups have either failed or been limited to relatively low levels of competence. Reports in 2002 and again in mid-2004 indicated that the investigations into the source of the anthrax used in the U.S. events were yielding results.¹³¹ These had apparently reached the stage that suggested which U.S. laboratory had been the source of the strain used. Nevertheless, there has been no identification of the perpetrator or resolution of the case. In the words of former Deputy Assistant to the Secretary of Defense for Chemical and Biological Defense, Dr. Anna Johnson-Winegar, “We do not know who was responsible. We do not know the source of the anthrax spores (i.e., were they produced, stolen, or purchased?). We do not know the motive for the attacks. And, therefore, we are unable to make intelligent assessments about the likelihood of similar attacks in the future.”¹³²

In the midst of all these developments, and the information derived from investigations in Afghanistan, October 2003 saw the amazing report that the U.S. DoD had been selling surplus equipment of the kind that could be used precisely for producing BW pathogens, and that some of the equipment purchased by middlemen in the United States had been resold to buyers in, among other countries, the Philippines, Malaysia, Egypt, Canada, Dubai, and the United Arab Emirates (UAE), “for transit to other countries prohibited from receiving exports of trade security controlled items.” U.S. officials in the past had identified individuals in Canada, the Philippines, Dubai, and in the UAE who are known to be involved in transshipments to terrorist-supporting countries. The sales had been made by the Defense Reutilization and Marketing Service, which in 3 1/2 years had sold 18 safety cabinets, 199 incubators, 521 centrifuges, 65 evaporators, and 286,000 full-body protective suits.¹³³ One can compare this to the reports of the few pieces of elementary equipment found in the al-Qaida site in Afghanistan, and the significance that was given to those finds.

The items sold are all available on the commercial market in the United States as well as elsewhere, but DoD’s selling price was additionally “pennies on the dollar” of the cost of the original items. More accurately, it averaged 10 cents on the dollar of original costs, even if the equipment was unused. In the words of a Congressional

subcommittee chairman, "DoD should not be a discount outlet for bioterrorism equipment." Export of these items would routinely require an export license if they had been sold for export, and the new Department of Homeland Security (DHS) had already begun monitoring the import and export of the same kinds of materials. Even recent internal DoD regulations had been violated. The U.S. GAO, the investigative and oversight body that serves the U.S. Congress, was responsible for the report, which documented this absent-minded but gross evasion by a branch of the U.S. DoD of common sense and of existing export controls on materials that could be used for the production of biological agents.

After the years of strident alarms regarding the interest of international terrorist groups in biological weapons, and after the U.S. domestic anthrax incidents in 2001 and the enormous post-9/11 buildup of "Homeland Security" to protect against bioterrorism involving expenditures of \$7-8 billion by the time of the GAO report in the fall of 2003, this was an amazing demonstration of one dysfunctional branch of government facilitating exactly what the rest of the government was ostensibly trying to protect against. To add to the irony, the 3 1/2-year period investigated – between October 1, 1999, and March 31, 2003 – places its onset during the tenure of none other than Secretary of Defense William Cohen, avid warner of "the bioterrorism threat."

PART IV

FRAMING “THE THREAT” AND SETTING THE AGENDA OF PUBLIC PERCEPTION AND POLICY PRESCRIPTION

Well before October-November 2001, the spectre of “bioterrorism” benefited from an extremely successful sales campaign. Between 1995 and 2001, the most common portrayal of the potential for “bioterrorism” was the facile catchphrase, “It’s not a matter of whether; just when.”¹³⁴ This proved to be one of the most successful catchphrases since the old soap-powder advertisement, “Duz Does Everything.” But, of course, it was a matter of both “whether” and “when,” or at least it might have been in this initial period. Those calling for preparation and preventive measures certainly believed, at a minimum, that the imagined sequel to whether and when, “. . . and with what consequences,” could be affected. That was the purpose of the wake-up calls. But “whether” and “when” were modifiable also, depending on the policies chosen. It depended most particularly on how the threat was portrayed, and how that portrayal was broadcast to potentially interested parties around the world. Perhaps bioterrorism is a given between whenever “now” is and decades hence, but lots of things can intervene between now and then. The inflated predictions that were common were certainly *not* realistic. Much worse, in addition to being wrong, inflated predictions were counterproductive. They induced interest in BW in the wrong audiences.

One immediate problem was the conflation of biological weapons and “bioterrorism” (and even between biological “agents” and “weapons”). Biological weapon use had been possible in the entire 20th century. Now the entire subject became subsumed under “bioterrorism.” That simple switch in language made it easy to transfer levels of state capability to “terrorists.” Everything became and was referred to as “bioterrorism.” This wiped out any discrimination, or attempt to discriminate, between the relevant capabilities of state programs and existing terrorist groups as they are known to date. The possibility of incidents involving low numbers of

casualties evolved in 2 or 3 years to “mass casualty” terrorism, and in several more years to “Apocalyptic Terrorism.” Generic terrorist groups (excluding the perpetrator of the U.S. anthrax events) – none of which had yet shown the ability to master their microbiological A, B, C’s in the real world – were endowed with the prospective ability to genetically engineer pathogens. Yet the resources and capabilities available to states and to terrorist groups are vastly different.

If we go back 10 years or so, we can look at a series of portrayals of the threat. A 1997 U.S. DoD Defense Science Board report grouped the characteristics of both chemical and biological warfare agents:

- They are relatively easy to obtain (certainly compared to nuclear), and potential users do not need access to large and expensive facilities to achieve potent capabilities.
- They can be developed and produced in laboratory or small scale industrial facilities, which makes them difficult to detect. Also, the technologies required to produce them often have commercial applications as well, so their “dual use” can be plausibly denied.
- They can be extremely lethal, so small quantities can be very effective.
- They can be delivered by a variety of means.¹³⁵

The paragraph went on to add that “A few kilograms of a biological agent could threaten an entire city.” Summations of this kind were grossly oversimplified even further. Former Secretary of the Navy Richard Danzig’s 1997 and 1999 papers contain an example: “. . . a kilogram [of anthrax], depending on meteorological conditions and means of delivery, has the potential to kill hundreds of thousands of people in a metropolitan area . . . biological weapons are so potent and so cheap . . . the technology is readily available . . . so many of our adversaries have biological warfare capabilities . . .”¹³⁶ They do have “the potential,” but they might also kill only few, or none at all. More correctly, not 1 kilogram but some 50 kilograms could kill anywhere between 0 and 95,000 people, depending on the initial population number, the quality and nature of the anthrax preparation, the meteorological conditions, and the means of delivery if distributed

over a city. More recent model studies by Dean Wilkening at Stanford University have demonstrated the difficulties in releasing biological agents so that they are infective in large airborne releases. The model studies show very wide ranges of variability, over five log units (orders of magnitude).¹³⁷

The years between 1995 and 2000 were characterized, then, by:

- spurious statistics (hoaxes counted as “biological” events);
- unknowable predictions;
- greatly exaggerated consequence estimates;
- gross exaggeration of the feasibility of successfully producing biological agents by nonstate actors, except in the case of recruitment of highly experienced professionals, for which there still was no evidence as of 2000;
- the apparent continued absence of a thorough threat assessment; and,
- thoughtless, ill-considered, counterproductive, and extravagant rhetoric.

Nonetheless, these descriptions were considered realistic and taken seriously by people responsible for public safety in various sectors: the Director of the World Trade Center in 2001 reported that “What the security people and others were telling us was that the threat was chem-bio. . . . We felt this was the coming wave.” He acted on that information, purchasing protective suiting and training programs for his own security personnel. The very day after 9/11, former Secretary of Defense Cohen predicted that the next attack by al-Qaida would involve biological weapons. There were authoritative assessments during the same period that were substantially different, offering more sophisticated accounts of impediments to successful “bioterrorism.” Some of these were made by Colonel David Franz, then Deputy Commander of USAMRIID; John Lauder, then Special Assistant to the Director of Central Intelligence; and Dr. Steven Block, Chair of a U.S. DoD Defense Science Board “Summer Study on Biological Weapons” – as well as Dr. Brian Jenkin’s critique of “fact-free analysis.” All these went by the board after 9/11 and the anthrax events that followed in October and November 2001.¹³⁸

Five essential requirements must be mastered in order to produce biological agents:

- One must obtain the appropriate strain of the disease pathogen.
- One must know how to handle the organism correctly.
- One must know how to grow it in a way that will produce the appropriate characteristics.
- One must know how to store the culture, and to scale-up production properly.
- One must know how to disperse the product properly.¹³⁹

A U.S. military field manual dating back to the 1960s remarks on the attributes of a desirable BW agent, that in addition to its pathogenicity, “means must be available for maintaining the agent’s virulence or infectivity during production, storage, and transportation.”¹⁴⁰ One should add, most particularly during its dispersal as well. Two members of Sweden’s biodefense program stress methods on how to optimize formulations of BW agents as the most critical step of all: “They key competence is . . . how to formulate the organisms to facilitate aerosolization of particles that cause severe disease by inhalation.”¹⁴¹

It is interesting that the classified 1999 DIA report quoted earlier in the section on state programs contained a single sentence regarding the possible use of BW agents by terrorist groups: “Terrorist use should also be anticipated primarily in improvised devices, probably in association with an explosive.”¹⁴² No anticipation of the capability for aerosol distribution was mentioned, no overflight of cities, sports stadiums, etc.

In a recent BW “Risk Assessment” published elsewhere, a group of authors from the Sandia National Laboratory listed a series of factors closely paralleling the above as “Technical Hurdles to Successful BW Deployment”: acquisition of a virulent agent; production of the agent in suitable form and quantity; and, effective deployment of the agent.

This was summed up in simple words as “obtaining a pathogen or toxin . . . , isolation, amplification, protection against environmental degradation, and development of an effective dissemination method.” They concluded that “Even a low-consequence event requires a

considerable level of expertise to execute.”¹⁴³ Dr. Steven Block, Chair of the U.S. DoD Defense Science Board Summer Study on biological weapons in the late 1990s explained the same requirements.

A lesson from the Aum Shinrikyo case is that any group bent on developing offensive bio-weapons capabilities must overcome two significant problems, one biological and the other physical. First, it must acquire and produce stable quantities of a suitably potent agent. For a variety of reasons, this is not the trivial task that it is sometimes made out to be. Second, it must have an effective means of delivering the agent to the intended target. For most, but not all, bio-weapon agents, this translates into solving problems of dispersal. Programs in both the United States and the USSR devoted years of effort to perfecting these aspects.¹⁴⁴

Unfortunately, a recent example provides the sort of grossly uninformed description that is more frequently provided to the general public. Speaking at the Harvard Medical School on June 1, 2005, and trading on his training as a medical doctor as he frequently does, Senator Frist claimed that “. . . a few technicians of middling skill using a few thousand dollars worth of readily available equipment in a small and apparently innocuous setting [could] mount a first-order biological attack. It is even possible to synthesize virulent pathogens from scratch, or to engineer and manufacture prions . . .” He repeated that this was “the single greatest threat to our safety and security today.”¹⁴⁵ The remarks are a travesty: “. . . a few *technicians* . . . middling skill . . . few thousand dollars,” leading to a “*first-order*” a biological attack, and additionally extending this to “synthesizing virulent pathogens” in the same breath.

To bolster his argument, Senator Frist larded his presentation with other gross inaccuracies, claiming that “During the Cold War, the Soviet Union . . . stockpiled 5,000 tons *annually* of biowarfare-engineered anthrax resistant to 16 antibiotics.” The only source in the world for the tonnage of anthrax stockpiled by the USSR is Dr. Ken Alibek.¹⁴⁶ He has never quoted a figure higher than 200 tons, and he has never claimed that the 200 tons was produced “annually,” or in any single year. The USSR’s anthrax stockpile consisted of a genetically unmodified classical strain (or strains).¹⁴⁷ The antibiotic resistant strain which was developed by Soviet BW laboratories in the mid- to late-1980s was not resistant to 16 antibiotics, but to half that number, and had not yet reached the point of being stockpiled

by the time that the Soviet BW program began to be cut back in 1989. Finally, the 5,000-ton figure is the approximate sum of the annual production capacities of all Soviet-era BW mobilization production facilities that would have initiated production only with the onset of, or just prior to a (nuclear) war with the United States. No such quantities of BW agents were ever produced in the USSR.

Scenarios and Exercises.

If one looks at the scenarios used in various exercises carried out by U.S. Government agencies or private institutes, one finds the following:¹⁴⁸

- [Unnamed], March 1998, Mexico-Texas border: smallpox chimeric viral agent (following Alibek).
- Top Off I, May 2000: aerosolized plague, FEMA and U.S. Department of Justice.
- [Unnamed], July 2000: aerosolized pneumonic plague, U.S. Department of Justice and DoD DTRA.
- Dark Winter, June 2001: aerosolized smallpox, Johns Hopkins Center for Biosecurity and three collaborating groups.
- Sooner Spring, April 2002: smallpox, National Memorial Institute for the Prevention of Terrorism (MIPT), Oklahoma.
- Top Off II, May 2003: aerosolized plague, U.S. DHS and U.S. Department of State.
- Atlantic Storm, January 2005: Aerosolized dry powder smallpox, Center for Biosecurity (now affiliated with the University of Pittsburgh Medical Center).
- Top Off III, April 2005: aerosolized pneumonic plague, U.S. DHS.

The Dark Winter exercise used a person-to-person secondary transmission rate (RO) of 10, three times the historical average of three.¹⁴⁹ Pneumonic plague has a historical average transmission rate of one.¹⁵⁰ Nevertheless, there are indications that the Top Off 2 and 3 exercises used values five times as high, and the July 2000 exercise used a value of 10. Such inflated transmission rates, of course,

make it next to impossible for the game players to do very much to contain the outbreak, and assure a disastrous outcome irrespective of whatever control measures the players may attempt to carry out.

Plague is known to microbiologists who routinely work with it as a “difficult,” “skittish” agent, “fragile and fastidious” in the laboratory. That a terrorist group would be likely to manage that seems very unlikely. In addition, plague organisms die very quickly when aerosolized, and both the United States and the UK failed for years in attempts to aerosolize plague. Both the British and U.S. BW programs in the 1950s field tested plague in open air field trials using animals, and the tests failed. The USSR BW program, with many more man-years of work, apparently did succeed in producing an aerosolizable plague agent. Did the Top Off scenario builders know of the efforts of the British and American BW programs to aerosolize plague and the outcome of those efforts? Did they know of the negative results, or decided to simply disregard them in any case? In the first case they could be accused of ignorance, in the second case of incompetence. They finessed the problem, however, by saying that the terrorists “obtained a sample” of the plague. But what kind of sample? Was it aerosolizable? From whom did they get it? In what quantity? Did they have to culture it? If so, how did they manage that? How was it dispersed? The scenario is not meant to answer these questions, which, of course, would all be crucial in the real world to determining whether a terrorist group was capable of producing and dispersing plague. Its purpose is simply to present a situation for the responders to deal with, without bothering with the question of how the situation came about, its likelihood, or in fact if it could take place at all.

In an influential August 2003 monograph, Richard Danzig suggested four cases that he recommended for “near term planning premises.”

1. A large-scale outdoor aerosol anthrax attack.
2. A large-scale outdoor aerosol smallpox attack.
3. An attack that disseminates botulinum toxin in cold drinks.
4. An attack that spreads foot and mouth disease among cattle, sheep, and pigs.¹⁵¹

Danzig adds that “. . . these cases . . . are real, possibly imminent, and very substantial dangers. Virtually all experts and policymakers agree with this.” Despite that, he added “. . . in the immediate future, most attacks are likely to be versions, often lesser version, of these cases.” Nevertheless, at the same time Danzig routinely speaks of “reloads,” and of terrorists producing sufficient quantities “that can be used again and again” in a series of attacks crossing the United States.¹⁵² That is scarcely “a lesser version.” Casualties resulting from Case #3 would be identified almost immediately and would be quickly limited. Case #4 would have serious economic consequences, but not human public health ones. Cases #1 and #2 are the significant ones, and comparable to the exercise scenarios listed above.

The same holds for the BW cases among the official “Planning Scenarios” of the U.S. DHS. Of 15 selected scenarios, four concerned BW:

#2. Biological Attack, aerosolized anthrax, in five cities in succession;

#4. Biological Attack, aerosolized plague in three locations in a single city;

#13. Biological Attack, liquid anthrax placed in ground beef in a factory, resulting in intestinal anthrax, mortality in the low hundreds; and,

#14. Biological Attack, Foot and Mouth Disease; economic loss, no human mortality.¹⁵³

Again, it is the first two of these four scenarios that are of prime concern since they are the ones capable of producing mass casualties.¹⁵⁴

However, the capabilities that would have to be posited for the above scenarios are far beyond the present and “near term” capabilities of any known terrorist group. (As before, the perpetrator(s) of the U.S. anthrax events is/are excluded.) That is particularly the case for smallpox. The counter argument, even by those who accept that fact, is obvious, and was presented by Dr. Gerald Epstein in Congressional testimony in February 2005.

Exactly how close terrorist groups are right now to the capability to conduct a major biological attack matters if we want to know how likely it is that such an attack will take place in the near future. However, looking out over the several years that our defensive preparations will

take to implement, the details of today's threat are less important than the realization that the rapidly increasing capability, market penetration, and geographic dissemination of relevant biotechnical disciplines will inevitably bring weapons capabilities within the reach of those who may wish to use them for harm.¹⁵⁵

"Inevitably" is longer than "several" years.

Examining the Assumptions of One Exercise in Detail: Atlantic Storm.

An excellent example of grossly misleading assumptions underlying the more advanced scenarios and base cases was provided by the seventh exercise listed above, "Atlantic Storm," which took place on January 14, 2005.¹⁵⁶ The comments below concern *only* the assumptions used by the producers of the exercise to argue that the terrorist group they envision would have obtained, produced, and distributed a dry-powder preparation of smallpox. These comments do not concern at all how the scenario unfolded once the hypothesized preparation had been released.

The group responsible for producing and releasing the smallpox was defined as a "Radical al-Qaida Splinter Group." In contrast, as best is known from the declassified documents and all the other materials obtained by U.S. military forces in Afghanistan in November and December 2001:

- No al-Qaida capacity for culturing viruses has ever been identified.
- No al-Qaida group has yet been able to obtain a pathogenic strain of anthrax.
- The group operating in Afghanistan in 2000-01 had apparently not yet reached the stage of attempting to culture vaccine strain anthrax. It had been provided with U.S. and UK microbiological journal literature from the 1950s and 1960s. The "methods" sections of those papers would have provided some aid for understanding culturing requirements for anthrax. They would not have assured success in doing it.
- Al-Qaida affiliated groups apparently either have not yet been able to synthesize ricin, or have not yet attempted to do so.

As indicated earlier, the “traces” of ricin reported as having been found in London several years ago turned out to be false positives. No ricin was found when the United States overran the al-Qaida affiliated Ansar al-Islam camp in Northern Iraq in March 2003.

The scenario posits that “Seed stocks of Variola major [smallpox] virus . . . were obtained . . . from a bioweapons facility in the former Soviet Union. This strongly implies that the “facility” suggested would be one of the former premier institutes of the Soviet Biopreparat system, Vector, located in Koltsovo near Novosibirsk, Russia. When the Iranian government made overtures to Vector scientists in the years around 1994, offering very generous payment to come and work and/or teach in Iran, they failed to convince a single member of the institute to come to Iran. These facilities are in better shape now than they were 10 years ago, both in their financial circumstances and in their biosecurity arrangements. At a first approximation, it therefore seems highly unlikely that an al-Qaida affiliated group would be able to obtain a smallpox sample from Vector. A U.S. Government official with frequent contact with this facility thought that “the probability was low.”¹⁵⁷

The Atlantic Storm scenario attempts to prop up the basic implausibility of this point in its assumptions by a gratuitous “Intelligence Briefing” which states that “information from U.S., UK, French, and German intelligence” corroborated that the al-Qaida group “has made contacts with former Soviet bioweaponers.” If it were the case that no less than four Western intelligence agencies had been informed of the “contacts” by the al-Qaida group, it would seem that there would have been a good chance to abort the activities of the group. The scenario organizers point out that smallpox is also assumed to be located in Russia in another institute besides Vector, one belonging to the Ministry of Defense (MOD). That may very well be the case, but if Vector has, to date, not been penetrated by “terrorist” groups, it is still less likely that a Russian MOD facility would be successfully penetrated.

The scenario posits that the al-Qaida group’s scientists received microbiological training at Indian and U.S. universities. These scientists received additional training when the group hired a

scientist who was part of the former Soviet Union's offensive biological weapons program. This scientist taught the [al-Qaida group] scientists how to grow a number of biological agents, including variola major [smallpox], *Bacillus anthracis*, Ebola virus, and *Burkholderia mallei* [glanders]. The terrorist group combined this knowledge with publicly available technical information to develop dry powder preparations of the viruses. Then, with their own microbiology training, the terrorist group was able to acquire all the required laboratory equipment to grow and process the Variola major seed stock they had acquired into a relatively high-quality dry powder that was then used in the attacks.

In the real world, Al-Qaida had one single individual who had received a BS degree in Biology "with a clinical concentration" at a U.S. college. He could in no way be described as a "scientist." Furthermore, he was arrested in December 2001. The individual with more advanced training who supplied al-Qaida with its microbiological literature was unwilling to himself do any laboratory work for them. The few pieces of standard equipment obtained by the group in Afghanistan were rudimentary in the extreme.

The USSR's BW program and the organization of its relevant institutes would make it extremely unlikely that a single former Soviet BW scientist would know how to grow and work with both Variola (smallpox) and Ebola viruses, as well as *B. anthracis* and *B. mallei* bacteria. Even the Soviet virologists who worked with Ebola and with Variola were in separate teams. Even more significant, growing the viruses in tissue culture requires knowledge of tissue culture growth and maintenance. Soviet institutes such as Vector had very sizable teams of specialists simply to do the tissue culture preparations on which the viruses could grow. These individuals would never have had experience growing *B. anthracis* or *B. mallei*. In addition, not even the Soviet BW program succeeded in making a dry-powder preparation of Ebola, the second virus that the scenario includes.

When the former director of a Western national BW defense laboratory was asked how long it would take a fully competent professional group of experienced microbiologists who had never before worked with viruses or tissue culture to successfully grow Variola in tissue culture, he estimated 5 years. When asked how long

he thought it would take a group of not very competent individuals to do it, he estimated 10 years to never.¹⁵⁸ Smallpox can also be grown on the Chorio-allantoic membrane of fertilized chicken eggs. While Soviet scientists grew vaccinia in eggs in their process of making vaccine against smallpox, even that requires experience and careful, tedious technical work.

In response to some of these criticisms of the Atlantic Storm scenario, two of its principal creators, Colonel Randall Larsen and Dr. Tara O'Toole have both invoked,

... a once-secret Defense Department experiment called Project Bacchus [sic], which was conducted in the late 1990s to assess whether terrorists could create a biological terror weapon using commercially available equipment.

The project "demonstrated quite persuasively that about four people, only one of whom had any biological training at all—and that was not with the U.S. weapons program; that was a degree in biology—could, using materials bought through the Internet, set up shop, undiscovered, and create a *Bacillus anthracis* look-alike," O'Toole said.¹⁵⁹

The statement is wrong on numerous grounds. First, the description of the Biotechnology Activity Characterization by Unconventional Signatures (BACUS) project that has been publicly available and is repeated by O'Toole and Larsen is essentially misleading.¹⁶⁰ Its purpose was *not* to see "*whether terrorists could create*" but to be *certain* that the experimental group *did* successfully "create," in order to see if detectable signatures would result that could subsequently be used by U.S. forces in the field hunting for such sites. To that end, the group was composed of much more than "about four people, only one of whom had any biological training at all." The on-site portion of the team was composed of 8-10 people, many of whom had post-graduate degrees and experience. One held a Ph.D. in microbiology from Oak Ridge National Laboratory. Another had a masters degree in engineering, while another served in Special Forces intelligence, and so on. The team had been specifically selected so that all the aptitudes considered necessary to complete the project successfully would be represented. They were to produce a harmless bacterial anthrax simulant; no work with viruses or with any lethal

pathogen comparable to smallpox was involved. In addition, this on-site group was backed up by four or five highly experienced biological weapons specialists acting as consultants, whose role it was to oversee their work to be certain that *no* errors were made, to the point of correcting a decimal place in a calculation.

In addition, the same group had gone through this exercise in an earlier classified project named BITE SIZE. The two projects differed primarily in their physical location—underground and above ground—and the purpose of both projects was to serve as a test for new detection methodologies. They were *not* experiments to see “whether” the group could succeed. The claim that the experience of the BACUS group proves the legitimacy of the Atlantic Storm scenario is completely unsupportable.

Location of preparatory work by the al-Qaida splinter group: The scenario describes the group’s laboratory as having been “disguised as a small brewery in Klagenfurt, Austria.” With all the years of claims that the production of biological agents could take place “in breweries,” it would not be surprising if readers of the extensive media coverage of the Atlantic Storm exercise might have thought that the smallpox was being grown in the fermenting vats of a brewery. For various technical reasons, that would be virtually impossible. Viral bioreactors are, in contrast to brewery fermenting vats, relatively small. The scenario, in fact, does not explain by which method the group would have been able to produce its smallpox. It says only “Smallpox virus can be grown in embryonated eggs and a variety of tissue culture systems.” Work with viruses and cell culture is very much more difficult than growing bacterial cultures, and the difficulties of cell culture for the putative group have been referred to above. Embryonated chicken eggs must be special-ordered. The suppliers are limited, and the customers are limited and usually well-known to the suppliers. If the group ordered the thousands and possibly tens of thousands of embryonated eggs and the egg incubators that would be required for this method of growing smallpox virus, local suppliers might wonder why an ostensible brewery needed thousands of embryonated eggs, since only yeast, hops, and grain would be ordered by a brewery. Suppliers therefore would be likely to report such information to local authorities, offering another

opportunity to abort the group's activities. Operating breweries in Austria are very highly regulated and routinely inspected. Even construction of a brewery requires government licensing, design approval and construction inspections. Applications for ownership or operation are also regulated. Inspectors who would chance on masses of incubating embryonated eggs would immediately be alerted to the covert operation.¹⁶¹

The group would also have to prevent the escape of the grown smallpox virus in liquid and solid waste effluents. Incineration, water sterilization and air-handling equipment are not normally installed in "a small brewery." These auxiliary systems alone are relatively large, and the ability for them to be housed together with the laboratory facilities "in a building as small as a 3-car garage," which the scenario suggests would be possible, is extremely unlikely. More probably, it is impossible. These auxiliary systems must also be custom-installed by specialists, and then tested. Depending on how or where the smallpox vaccinations for the terrorist group were obtained, that too could run the risk of being noted.

The Atlantic Storm scenario involved the distribution of a dry-powder smallpox preparation from "a commercially available dry powder dispenser" by vaccinated individuals in six different cities (Istanbul, Frankfurt, Rotterdam, Warsaw, Los Angeles, and New York City) over a span of 4 days. As regards preparation of the smallpox powder, the scenario says only that "several sources for information on methods" are available, and that "Variola virus can be processed to a stable dried form just as vaccinia virus is dried to make a vaccine."

Such work was never carried out in the British government's BW program. Work with virus culture in the British program was extremely rudimentary overall. It did advance further in the pre-1969 U.S. BW program, but some years ago one of the individuals involved in that work, Dr. William Patrick, offered the judgment that "*Only a state-sponsored group of terrorists with a lot of money and connections would be able to acquire the smallpox virus and the means for wielding it as a weapon.*"¹⁶² The Atlantic Storm scenario producers knew this quotation, since they have elsewhere used an accompanying sentence by Patrick as a source.

Speaking at a conference on April 22, 2005, after the details of Atlantic Storm were known, Dr. Ken Alibek, the former Deputy Director of the Soviet-era Biopreparat BW research and development program, commented that he could “not understand why some people make these scenarios using dry powder smallpox.” He explained that “no one” – that is, the Soviet BW program – “wanted to or could develop dry powder smallpox.”¹⁶³ He gave two reasons for that: first, that the Soviet BW program had been able to develop a preparation that kept smallpox stable in liquid; and second, that it was much too dangerous for their own staff to prepare dry powder smallpox preparations, even working in facilities with elaborate and advanced containment systems. The claim in the Atlantic Storm scenario that, nevertheless, this could have been achieved by a small inexperienced group has absolutely no chance of being credible.

As for “Sources for Information” on methods, simply having them on paper would certainly not be sufficient, though it is the necessary first step. Even vaccinia is grown under conditions of containment, but there is one critical difference: drying variola would have to be carried out under extremely rigorous conditions of containment of the opposite nature, that is, under negative air pressure, rather than positive. The necessary air-handling equipment is sizable and is not part of the infrastructure of a brewery. It is also not simply purchasable from catalogues and, as indicated, would have to be custom installed.

Elsewhere, Dr. Patrick has written,

A dry product with these [desired] properties requires serious development with skilled personnel and sophisticated equipment. . . . [While] Iraq successfully produced high quality liquids of anthrax and botulinum toxin A in quantity, their efforts to weaponize their agents were crude and far from successful. . . . By analogy, if a dedicated nation such as Iraq had problems with agent delivery and dissemination, it follows that terrorists would also experience these problems, and at a higher level of intensity.¹⁶⁴

Dispersal of the dry-powder preparation took place over a period of several hours in each location. Does a “commercially available dry powder dispenser” produce the particle size distribution required for human aerosol infection? Is it battery-powered or gas cartridge-

powered to operate noiselessly? The device that the Aum Shinrikyo group had made but never used in a Tokyo subway was designed to distribute a liquid and would have worked for only a short period.

Spread of the smallpox epidemic. The Atlantic Storm scenario uses rates of first generation person-to-person transmission of 1:3, and 1:0.25 for second generation transmission. This is a major correction from the value of 1:10 used by the same exercise sponsor in “Dark Winter,” its previous smallpox exercise in June 2001. As recently as the spring of 2004, a member of the University of Pittsburgh group still defended the 1:10 estimate in a briefing given in Washington, DC.¹⁶⁵

Adding anthrax production by the same “al-Qaida splinter group,” presumably at the same brewery location. Several months after the initial Atlantic Storm exercise, its creators were able to repeat the exercise with 28 of the 34 members of the Homeland Security Committee of the U.S. Congress. After replaying the Atlantic Storm scenario (which followed a separate simulation of a terrorist attack using a 10 kiloton nuclear device), this time yet another component was added: “. . . [a] few days into the disaster, terrorists followed up with anthrax attacks in major cities.”¹⁶⁶ No other details were provided. This adds an entire additional layer of implausibility regarding the ability of an “al-Qaida splinter group” to produce anthrax, the delivery of growth media to the “brewery,” and so on, not to speak of the technical requirements of producing *both* anthrax *and* dry-powder smallpox. Brewery fermenters are not useful for growing anthrax, just as they are not useful for growing smallpox.

The individuals who played the roles of “World Leaders” in the exercise. These took the roles of purely political figures, presidents and prime ministers of their respective countries, except for one who played the role of Director-General of the World Health Organization (WHO). Of the 12 individuals, one had been the former Director-General of WHO, and a second had been a Minister of Health. Nevertheless, none had any experience with issues regarding biological weapons. This point is mentioned only to note that none apparently raised any questions regarding the basic plausibility of the scenario. According to those responsible for the exercise, the players were not even informed of the antecedent assumptions that are being discussed here. Two members of a European advisory

panel to the Atlantic Storm exercise recommended that it should deal with an outbreak of pandemic flu rather than smallpox, but the suggestion was rejected. Had pandemic flu been chosen, references to a “radical al-Qaida splinter group,” invoking “bioterrorism,” and so on would all have had to be discarded.

Media response. As best is known, not a single report of the exercise raised any questions whatsoever regarding the plausibility of the basic assumptions of the scenario.¹⁶⁷ Dr. O’Toole, Director of the Pittsburgh group that produced the exercise, stated that “The scenario we posited is very conservative. . . . This could have been much worse. The age of engineered biological weapons is here. It is now.”¹⁶⁸ Portions of the scenario once it was in play may have been conservative; however, “engineered biological weapons” are not relevant to an “al-Qaida splinter group,” and they are not “now” in relation to “terrorist” groups. Dr. O’Toole has also claimed that the scenario antecedents were made “as scientific as possible.” The preceding discussion demonstrates that they were very far from “scientific,” and were a combination of unrealistic and implausible imaginings. A *Washington Post* editorial ended with another O’Toole quote: “This is not science fiction. The age of Bioterror is now,”¹⁶⁹ and an enthusiastic *Washington Post* columnist described the exercise as an “eminently plausible scenario.”¹⁷⁰ Rather, it *was* science fiction because the scenario antecedents are not “now,” and they were not in the least plausible.

Another Recent Example: Botulinum Toxin and the U.S. Milk Supply.

Substantial controversy surrounded the recent publication of a model study examining the consequences of the postulated addition of botulinum toxin to the U.S. milk supply.¹⁷¹ Publication of the paper in the *Proceedings of the National Academy of Sciences* (PNAS) had been delayed for a month due to a request by an official in the U.S. Department of Health and Human Services (DHHS).¹⁷² During that interval, the author, Dr. Lawrence Wein, released his conclusions in a guest editorial in the *New York Times*.¹⁷³ Dr. Wein, a mathematical modeler at the Stanford University School of Business, posited that “a terrorist” – that is, a single individual – could produce, variously, a

“few grams,” ten grams, or even as much as a kilogram of botulinum toxin, “using a 28-page manual called ‘Preparation of Botulinum Toxin’ that has been published on several jihadist websites, and [could buy] toxin from an overseas black-market laboratory.” He estimated that ten grams of the toxin might poison 568,000 people, of whom as many as 60 percent might die.

It was possible to obtain a copy of the manual, which appeared to be composed of the linked reproductions of the methods sections of several journal papers. The manual did not explain how to obtain “a producer strain” of *Clostridium botulinum* in the first place, other than suggesting trial and error from sources in the wild. There are seven serotypes of *C. botulinum*, each containing around 100 strains. Many strains of *C. botulinum* produce no toxin at all, or very little. It took the pre-1969 U.S. biological weapons program many man-years of work by competent professionals to find a reliable toxin producing strain. The manual required the use of a walk-in cold room, a refrigerated vacuum centrifuge, highly specific reagents, etc. None of these, as well as many other necessary components, would likely be found in “jihadist” camps. More importantly, having the manual, or having the books or journals from which it is derived, does not confer on anyone the ability to make botulinum toxin. That requires knowledge and experience, and it is not the simplest procedure. Producing ten grams would be a feat even for an experienced professional. It is useful to remember that the Japanese Aum Shinrikyo group, with no constraints on funds for purchasing equipment and supplies, spent 3 to 4 years attempting to produce botulinum toxin and failed. It is now known that the Aum had never even been able to obtain a culture of the organism to work with. The author of the model introduced “an overseas black market” as an obvious *deus machina* to evade these difficulties, but no international black market for botulinum toxin is known to exist. The author also appeared to be unacquainted with the journal literature regarding the purification of Botulinum toxin, which would indicate what some of the difficulties are.

The author admitted in the PNAS paper that three variables in his model “each contain several orders of magnitude of uncertainty.” They appear to each contain at least three orders of magnitude of uncertainty. Cumulatively, the author’s calculations could therefore be off by as much as nine orders of magnitude—a billion times—

which could mean that not a single person would be poisoned or die. If a mathematical model is widely divergent in its assumptions from reality, all the mathematics in the world will not improve the accuracy of its predictions.

One of Dr. Wein's two main recommendations was that the milk industry increase the temperature and duration time for milk pasteurization. Over a period of several years, the International Dairy Foods Association (IDFA) had, in fact, already done this, developing new procedures which result in 99 percent inactivation of any botulinum toxin present. By mid-2004, the IDFA had recommended to its affiliated milk distributors that such changes be instituted, although there was no legal statute that required that the steps be followed by all producers. Dr. Wein had learned of this in 2004 while giving seminar presentations of his model, but it apparently did not alter his calculations.¹⁷⁴

Efforts to arrive at realistic assessments have frequently been unwelcome. In 1998, D. A. Henderson wrote that:

Four points of view prevalent among national policy circles and the academic community at various times have served to dismiss biological terrorism as nothing more than a theoretical possibility. 1) Biological weapons have so seldom been deployed that precedent would suggest that they will not be used. 2) Their use is so morally repugnant that no one would deign to use them. 3) The science of producing enough organisms and dispersing them is so difficult that it is within the reach of only the most sophisticated laboratories. 4) Like the concept of a "nuclear winter," the potential destructiveness of bio-weapons is essentially unthinkable and so to be dismissed.¹⁷⁵

Henderson concluded that "Each of these arguments is without validity." Three of them certainly are: I have seen no one arguing the first, second, or fourth of these parodies. The closest approximation to the second are those studies by terrorism experts that seek to understand whether real terrorist groups might or might not consider using BW in light of their political interests, the potential responses of the publics whose support they seek, etc. Examples of such analyses by Parachini, Schweitzer, Simon, and others, based entirely on years of study of real international terrorist groups and not the result of abstract speculation, were referred to earlier. Only the third "point of view" which Henderson refers to, with some modification, is at

issue. More recently, Jill Dekker-Bellamy, Biodefense Consultant to a new European defense policy interest group, the New Defense Agenda, wrote:

We shouldn't be stuck in the box debating the lack of sophistication terrorists have yet employed; the feasibility question or which pathogen they will use, be it in a material or weaponised form. Our focus instead would be better placed considering the stated intent of terrorists to do so and preventing and denying them access to all the means to conduct their terror campaign. . . .

Much debate has gone into whether or not terrorists or states pose the greatest threat in the use of disease as a weapon. These debates over whether or not terrorists are capable of successfully conducting a biological attack normally get bogged down in a number of areas related either to acquisition, technical areas (i.e., feasibility/ dispersal/capacity) or areas related to kill ratios and casualty numbers as if this is the Geiger counter of successful biological terrorism. This may be of interest in ranking weapons of mass destruction but not necessarily in ranking a successful bio-terror campaign. Contemporary threat assessments, even more than 2 years ago, point to smaller groups as now being more likely to succeed in a bio-terrorism event, utilizing a diversity of agents.¹⁷⁶

The "contemporary threat assessments" referred to remained unidentified, and no one is "stuck in [a] box" or "bogged down." The intellectual "know-nothingism" in the above comment is palpable, and harks back to Brian Jenkins' 1999 description of "fact free analysis" in the area of bioterrorism assessment. There is no incompatibility between seeking the best preventive measures and having a moderately realistic threat assessment. A statement by U.S. Department of State Anti-Terrorism Coordinator William Pope that "Europe should expect biological, chemical, and radiological terrorist attacks at any time" is an example of the inadequacy that is so common in many cases.¹⁷⁷ In contrast, one recent thorough study carried out for the UN WMD ("Blix") Commission rendered a considered assessment without fear of getting into "boxes" or "bogged down," and without contrived scenarios carried out in a show-business atmosphere.¹⁷⁸

This brings us to some anticipation of the future. A very brief 2-page statement released in November 2003 by the U.S. CIA titled "The Darker Bioweapons Future" was limited to very general remarks:

A panel of life science experts convened for the Strategic Assessments Group by the National Academy of Sciences concluded that advances in biotechnology, coupled with the difficulty in detecting nefarious biological activity, have the potential to create a much more dangerous biological warfare threat. The panel noted:

- The effects of some of these engineered biological agents could be worse than any disease known to man.
- The genomic revolution is pushing biotechnology into an explosive growth phase. Panelists asserted that the resulting wave front of knowledge will evolve rapidly and be so broad, complex, and widely available to the public that traditional intelligence means could prove inadequate to deal with the threat from these advanced biological weapons.
- Detection of related activities, particularly the development of novel bioengineered pathogens, will depend increasingly on more specific human intelligence and, argued panelists, will necessitate a closer—and perhaps qualitatively different—working relationship between the intelligence and biological sciences communities.

In the last several decades, the world has witnessed a knowledge explosion in the life sciences based on an understanding of genes and how they work. According to panel members, practical applications of this new and burgeoning knowledge base will accelerate dramatically and unpredictably.

Growing understanding of the complex biochemical pathways that underlie life processes has the potential to enable a class of new, more virulent biological agents engineered to attack distinct biochemical pathways and elicit specific effects. The same science that may cure some of our worst diseases could be used to create the world's most frightening weapons.

The know-how to develop some of these weapons already exists.¹⁷⁹

Others have filled in what this may evolve into in future decades in more detail. Papers by James Petro, *et al.*, Robert Carlson, Raymond Zilinskas, Aleksandr Rabodzey, and others are recent examples which were published prior to the brief CIA item above.¹⁸⁰ These projections are not discussed further here. The purpose of this monograph has been to present a *current* threat assessment of “Bioterrorism” and what one may expect “in the near future.” Advanced genetic

engineering capabilities are not likely to become available to real-world nonstate actor/terrorist groups in the near future. Judgments based on the prevalence of genetic engineering competence in the general academic molecular research community are still not useful guides to terrorist capabilities. A classified U.S. Defense Intelligence projection prepared in July 1999 looking ahead to 2020 presented the following anticipation of developments in future national BW programs:

An increasing number of countries with biological warfare programs will be able to develop infectious agents such as anthrax and plague, as well as toxins such as botulinum and ricin. . . . New types of agents, such as modified infectious organisms, low-molecular weight physiologically active substances that disrupt body function, and synthetic modified toxins, are also in development.¹⁸¹

Given that this was written when the number of existing states with offensive BW programs was still considered to be higher and that the “new type of agents” referred to had all been available for decades, this was a relatively low keyed assessment. Speaking in 2001, Dr. Joshua Lederberg, probably the most highly qualified expert in this field, said “I don’t think we’re going to leapfrog to the second or third generation without seeing some of the more primitive efforts in the first instance.”¹⁸² In response to a statement by an official of the DHS in June 2005 that the Department had “developed a strategy to address the potential for a bioengineered attack,” Dr. Richard Ebright commented that “There is no—zero—current likelihood that a terrorist organization would construct ‘bioengineered’ viral pathogens, or would construct ‘bioengineered’ bacterial pathogens other than antibiotic-resistant bacterial pathogens.”¹⁸³

PART V

COSTS AND CONSEQUENCES OF THE U.S. BIODEFENSE PROGRAM

Until quite recently the massive U.S. post-9/11 biodefense buildup has been discussed almost exclusively in terms of its presumed necessity, the substantial improvements achieved in response readiness, the successive increase of expenditure and broadening programs, and urgings from various quarters for still further increases in expenditure and expansion of programs. Certainly, some of this was needed, and others have analyzed the efficacy or performance of various elements of U.S. biodefense expansion since 2001.¹⁸⁴ However, these programs should be justified on their intrinsic merits, and not due to alleged “spin-off” benefits for generic public health. “Spin-off” rationalizations for defense R&D expenditure historically have been spurious. They were made for the U.S. BW program over 35 years ago as well. The suggested “spin off” can always be procured for a fraction of the cost of whatever the larger parent program may be, by direct, targeted investments.

There are, however, also costs. The first of these is direct federal expenditure. Dr. David Franz is fond of pointing out that in 1996 and 1997, after the three major BW disclosures—of the USSR’s enormous covert and illegal BW program, the Iraqi BW program, and the failed attempts of the Japanese Aum Shinrikyo group to produce BW agents—U.S. biodefense expenditures were still in the range of roughly \$150 million per year. They increased to \$414 million by FY 2001. It was estimated at \$7.5 billion for 2005.¹⁸⁵ Annual *civilian* biodefense expenditure has risen more than 18-fold and has accounted for over \$22 billion in expenditure during the past 4 fiscal years.¹⁸⁶ The U.S. FY 2006 civilian biodefense budget adds another \$4.2 billion.¹⁸⁷ The question, of course, is whether this degree of expenditure is merited. That is where the threat assessment should be the crucial determinant. Cumulative DoD biodefense expenditure for the past 4 years is not available. The budget for the joint DoD

CB defense program was \$1.25 billion in FY 2004, \$1.38 billion in FY 2005, and \$1.6 billion in FY 2006.¹⁸⁸

The paradox of this situation is that this change in U.S. Government priorities is primarily due to the events of 9/11, which had no relation whatsoever to the capability to produce biological agents by terrorist groups. And as has already been indicated, the significance of the U.S. anthrax events in regard to the anticipation of future events of the same nature carried out by terrorist groups is also unclear. In carrying out the 9/11 aircraft attacks in the United States, the al-Qaida organization certainly was able to demonstrate its enterprise, ingenuity and organizational capabilities—as well as, we now know, a modicum of luck and the failure of various existing U.S. Governmental functions.¹⁸⁹ At the same time, it demonstrated that the group had not been spending the major portion of its time and effort to develop biological weapons. As a preceding section of this monograph indicates, as best is known, little regarding al-Qaida and BW has changed since. It is very possible that the U.S. political response and the congressional funding levels and programs that followed, would have been substantially smaller if it were known for certain that the Amerithrax anthrax had been prepared by a U.S. professional, or had been diverted from stocks prepared within the U.S. biodefense program. On the other hand, it undoubtedly would also have led to greater oversight of the U.S. biodefense program.

Another predictable cost has been the impact on other U.S. public-health programs and expenditures.¹⁹⁰ Currently one-third of both the National Institutes of Health (NIH) infectious disease budget and the Centers for Disease Control and Prevention (CDC) budget and more than half of U.S. Government and corporate vaccine development is relegated to biodefense, that is, it focuses on the “select agents,” those pathogens that are considered most likely to be used as biological weapon agents.¹⁹¹ Equally or more striking were tallies produced in February and March 2005 of changes in the funding patterns of the National Institutes for Allergy and Infectious Diseases (NIAID) at NIH in the years between 1996 and 2000 compared to 2001 to 2004. Grants for research on six bacterial pathogens on the select agent list grew from 33 in the first 4r-year period to 497 in the second. Tabulations for research on viral pathogens were similar, except for research on influenza. Grants for all other agents dropped between

20 and 50 percent just between FY 1999 to 2001 and FY 2002 to 2004, including for tuberculosis and acquired immune deficiency syndrome (AIDS).¹⁹² There has been a 30-fold increase in NIH-NIAID biodefense expenditure since 2001. It now accounts for over 35 percent of the current NIH-NIAID budget, an amount greater than for AIDS research and greater than for all other non-AIDS infectious disease research.¹⁹³ An extremely sharp attack on this shift in public health priorities appeared in the *American Journal of Public Health* in October 2004.¹⁹⁴ At the end of May 2005, NIH announced a shift in disbursement schedules for grants that would also lead to an earlier termination than planned for grants for some research projects on malaria, HIV/AIDS and other infectious diseases.¹⁹⁵

In a May 2005 report on U.S. preparations for a pandemic flu outbreak, the U.S. GAO pointed out that “the Department of Health and Human Services has not finalized planning for an influenza pandemic. In 2000, GAO recommended that DHHS complete the national plan for responding to an influenza pandemic, but the plan has been in draft format since August 2004.”¹⁹⁶ At the time of the 2000 report, GAO also took the DHHS to task for lack of progress in developing a vaccine against H5N1 flu.¹⁹⁷ At his retirement on December 3, 2004, DHHS Secretary Tommy Thompson cited pandemic flu as the greatest threat to be faced; yet the situation is virtually the same today as it was in 2000. Washington policymakers have had almost 9 years since the first outbreak of avian flu in 1997 to come to grips with the problem. Instead, the focus has been on “bioterrorism” and biodefense.

The U.S. CDC has offered one estimate of the consequences of a “medium level” flu pandemic outbreak in the United States “in the absence of any control measures” (e.g., vaccination and drugs):

- 15 to 35 percent of the U.S. population infected;
- 20 to 47 million cases of illness;
- 18 to 42 million outpatient hospital visits;
- 89,000 to 207,000 deaths; and,
- “associated costs ranging from \$71 billion to \$167 billion.”¹⁹⁸

The estimate of mortality appears to be low, given that its lower level is about the same as the upper level of ordinary annual U.S. flu mortality as shown in Figure 1 (page 5).

Nevertheless, even weeks after the above information was presented to Congress, U.S. senators and congressmen, both Democrat and Republican, were still focused on drumming up support for further increases in Federal expenditures against “Bioterrorism” to support “Bioshield II,” subsidies for medical countermeasures against “select agents.”¹⁹⁹ Only in November 2005 did the administration finally announce a plan and accompanying recommendations for expenditures to prepare for and to combat pandemic flu.

Biodefense Research and the Biological Weapons Convention.

The third area of cost concerns biological weapons arms control. This was treated to some degree in *The Problem of Biological Weapons*,²⁰⁰ and summarized in a subsequent paper by Jonathan Tucker.²⁰¹ Tucker makes two major points. The first concerns proliferation, and it is that “The most serious risk associated with science-based threat assessment is that the novel pathogens and information it generates could leak out to rogue states and terrorists.”²⁰² The risk may be less a “leak” in the classic sense than simply the accelerated accretion of relevant science and publications, and the substantial overall push that the field is now getting and which will continue in the coming years. Both the Aum Shinrikyo and the al-Qaida groups went back to look at professional literature of previous decades. It is the same procedure that new or expanding state programs followed, whether it was Russia in the 1950s and 1960s, or Iraq in the 1980s.

Tucker’s second main point is that the greatly increased magnitude of the U.S. biodefense R&D program will promote a BW arms race, and, at least on the part of others, perhaps not all of it of a defensive nature. The same point was made by Dr. Malcolm Dando in a submission to the British Parliament in February 2003.²⁰³ That arms race, at least in its initial stages, is more likely to be with developments in our own BW research program than against developments in the programs of other states or nonstate actors. This is exactly the process that took place in the United States from the late 1950s to the mid-1970s regarding development of intercontinental

ballistic missile (ICBM) re-entry vehicles (warheads) and ABM systems. It was succinctly described by Dr. Jerome B. Wiesner, President John F. Kennedy's "Science Adviser" (Special Assistant for Science and Technology), who had been involved with policy planning for these antagonistic weapon systems for years. It was a process in which development in our own offensive and defensive strategic nuclear missile systems fed off the certain knowledge of developments in the other.²⁰⁴ The "intelligence" was much more certain than guessing about what was going on in other nations' analogous programs, and could always be assumed, or attributed, to them. At times, such attribution was correct, and at times not, but even in the former case, new technological developments in the U.S. programs quite frequently were made well in advance of when they appeared elsewhere. Overall, the outcome was the same as that posited by Tucker: the stimulation of parallel programs in other states. The same very likely will occur now. At the present time, one can assume that a smaller replica of the U.S. biodefense program is taking place in Russia, smaller because of the great disparity in funding levels. Russia retains the personnel and facilities to build on their own work dating from their accelerated 1973 to 1992 (or longer) offensive program, as well as the ability to pick up from developments in the United States and in the nonmilitary published literature on the functioning of the human immune system, etc. In some cases, the United States is currently funding research in Russia that is BW applicable.²⁰⁵

The fourth cost also concerns arms control but is sufficiently significant and different to require separate consideration. It is the question of whether the U.S. Government, because of the biodefense R&D program, remains in compliance with the provisions of the Biological Weapons Convention (BWC), specifically Article I.

Towards the end of 1999, U.S. Director of Central Intelligence George Tenet had established a Non-Proliferation Advisory Group (NAG) to advise the CIA on what kinds of research it should undertake in order to better understand the problems that the agency faced in learning about WMD proliferation and, if possible, hindering it. In one of its meetings, NAG was given a briefing on a particular CIA BW-related project, code-named "CLEAR VISION." It involved the fabrication and testing of a model of a Soviet BW bomblet.²⁰⁶ It

appears that the project was already underway since 1997. One of the members of NAG was Dr. Joshua Lederberg, who has served as an adviser and consultant for BW issues to U.S. Government agencies for the past 4 decades. After hearing the briefing, Dr. Lederberg raised two considerations:

- that the project raised BWC compliance issues,
- that the project raised perceptual issues; that is, if the project subsequently became publicly known, it would raise questions in the view of observers as to whether the U.S. Government was engaged in activities of an offensive BW character.

He therefore suggested that the CIA Director could not authorize such a project on his own authority; it would have to be referred to the office of the President for consideration, and to undergo interagency review.²⁰⁷ Another member of NAG offered a third consideration: that if U.S. intelligence agencies discovered that another country was carrying out such a project, it would be considered *prima facie* evidence of the existence of an offensive BW program in that country. The project was then referred to the National Security Council (NSC) for review. It was nevertheless ultimately approved, over the minority objections of the legal adviser in the U.S. Department of State. It would be carried out at a classified level.²⁰⁸ As indicated, it appears the project was already in process by the time the briefing was given, and before the NSC review took place, and that more than one bomblet was actually produced in order to carry out different tests at different sites. None of four such projects – CLEAR VISION, BACUS, BITE SIZE, and JEFFERSON – were reported by the United States in its annual Confidence Building Measures submissions under the terms of the BWC.²⁰⁹ The ongoing utilization of several very large aerosol test chambers in U.S. biodefense projects was also not reported.

In the spring of 2004, a briefing which described the work program planned for the prospective National Biodefense Analysis and Countermeasures Center (NBACC), particularly for one of its four sub-centers, the Biothreat Characterization Center (BTCC), became available.²¹⁰ It was proposed that studies be carried out in 16 different subject areas, of which the following nine seemed

particularly significant: genetic engineering; susceptibility to current therapeutics; host-range studies; environmental stability; aerosol animal-model development; aerosol dynamics; novel packaging; novel delivery of threat; bioregulators and immunomodulators; and “Red Teaming,” that is, duplication of threat scenarios. In addition, task areas for bioterror-agent (BTA) analysis and technical-threat assessment were summarized as “Acquire, Grow, Modify, Store, Stabilize, Package, and Disperse.” Classical, emerging, and genetically engineered pathogens were to be characterized for their BTA potential. Aerobiology, aerosol physics, and environmental stability would be studied in wet-laboratory and computer-laboratory settings. “Computational modeling of feasibility, methods, and scale of production” would be undertaken, and “Red Team” operational scenarios and capabilities would be assessed. BTA use and countermeasure effectiveness would be studied “across the spectrum of potential attack scenarios” through “high-fidelity modeling and simulation.”

Article 1 of the Biological Weapons Convention states:

Each State Party to this Convention undertakes never in any circumstances to develop, produce, stockpile or otherwise, or retain:

- (1) Microbial or other biological agents or toxins, whatever their origin or method of production, of types and in quantities that have no justification for prophylactic, protective, or other peaceful purpose.
- (2) Weapons, equipment, or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.

In order to assure that the activities of all U.S. Government entities remained within the bounds of Article 1, on the ratification of the BWC in 1975 the White House issued the so-called “Scowcroft Memorandum” on December 23, 1975.²¹¹

As an indication of both the ambiguity and confusion surrounding the question of “offensive” and “defensive” biological weapons relevant research, the following official U.S. policy statements are important to note. A very brief U.S. DoD press statement on January 8, 2002, on Nuclear, Biological, and Chemical Warfare Defense answers the question, “Is the U.S. still developing biological weapons to use

against our enemies?" The answer provided began: "As required by executive order, the U.S. Government ceased all offensive biological research in November 1969 . . ." ²¹² However, the original 1969 U.S. policy decision is worded rather differently. The operative paragraph of National Security Decision Memorandum 35 of November 25, 1969, reads:

The United States bacteriological/biological programs will be confined to research and developments for defensive purposes (immunization, safety measures, etc.). This does not preclude research into the offensive aspects of bacteriological/biological agents necessary to determine what defensive measures are required. ²¹³

The analytic study that supported the U.S. policy decision also included a very important relevant paragraph. In response to the question, "Should the U.S. maintain only a RDT&E program," it replied:

There are really two sub-issues here: (1) should the U.S. restrict its program to RDT&E for defensive purposes only, or (2) should the U.S. conduct both offensive and defensive RDT&E? While it is agreed that even RDT&E for defensive purposes only would require some offensive R&D, it is also agreed that there is a distinction between the two issues. A defensive purposes only R&D program would emphasize basic and exploratory research on all aspects of BW, warning devices, medical treatment, and prophylaxis. RDT&E for offensive purposes would emphasize work on mass production and weaponization and would include standardization of new weapons and agents. ²¹⁴

At least through 1989, DoD considered studies which produced more virulent pathogens, sought to stabilize them, or studied dissemination methods, to be characteristic indicators of *offensive* BW research, and explicitly prohibited by the BWC. This was stated by Colonel David Huxsoll, then director of USAMRIID, in testimony to the U.S. Senate Committee on Governmental Affairs in May 1989, and clearly displayed in a diagrammatic schema attached to his testimony. (See Figure 2, below.) ²¹⁵

In 1989, after court action requiring a programmatic review of its Biological Defense Research Program, the United States recorded a decision to continue the Program, stating that it "is in full compliance

with the Biological Weapons convention” and “does not include the development of any weapons, nor does it attempt to develop new pathogenic organisms for any use.”²¹⁶

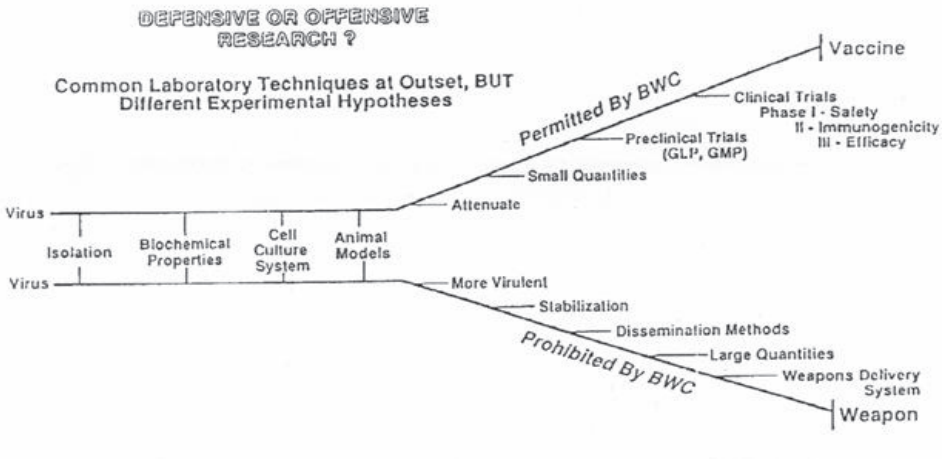


Figure 2.

After learning of the contents of the NBACC briefing described above, three veteran observers of biological weapons issues authored a memorandum entitled “Biodefense Crosses the Line.”²¹⁷ The three authors had no knowledge whatsoever of the 1999/Lederberg/CIA-NAG experience. The memorandum argued four points:

- That taken together, many of the activities itemized within the NBACC/BTCC research program – most particularly the “Store, Stabilize, Package, and Disperse” sequence and the “Computational modeling of feasibility, methods, and scale of production” – may constitute *development* in the guise of threat assessment. Development is prohibited by the Biological Weapons Convention.
- That they very likely would be interpreted that way by at least some other states.
- That U.S. intelligence agencies would judge a BW research program of this character and magnitude found in any other state to be an offensive BW program.

- That the program would stimulate analogous efforts in other states; in other words, the BW arms race that Tucker and Dando warned against.

Individuals within the current administration have agreed with the third point in conversations among themselves.²¹⁸

The response to this critique of the NBACC/BTCC research program by an official of the DHS in 2005 was a barely qualified self-incriminatory admission of the charge:

Homeland Security officials defend the biodefense program, saying that it will be as open as possible and will not breach the biowarfare agreement. But they concede that biodefense today, by necessity, requires stretching research boundaries beyond what would have been acceptable before the anthrax attacks. "If you have a bad guy who is trying to hurt you with a bioweapon, you have to understand how much material it will take to do harm, what kinds of packages he'll use to keep it stable, how he might deliver it, and how effective it will be," says Maureen McCarthy, director of the Office of Research and Development in the Homeland Security Department's science and technology division. "Those are hard questions. You can't answer them in a vacuum."²¹⁹

There is no "vacuum;" Article 1 of the BWC fills that space. And one cannot "stretch" international treaties to which one is a state party. A recent report on NBACC prepared for Congress by the Congressional Research Service unfortunately includes no discussion of these issues.²²⁰

On April 28, 2004, at the conclusion of a year's review, the Bush administration disclosed details of the new National Biodefense Directive.²²¹ Among them, reportedly, was that "the U.S. intelligence community is under orders to carry out studies examining the types of genetically engineered 'bugs' terrorists could be working on to mount an attack."²²² The intelligence community is not the place that such research should be carried out, if it should be carried out at all.²²³ Biodefense *is* the mission, all or in part, of a sufficient number of other U.S. Government agencies and facilities, which are perfectly capable of carrying out whatever tasks are necessary. These include:

USAMRIID (DoD)
Dugway (DoD)

The Centers for Disease Control and Prevention (CDC)
Walter Reed Army Institute of Research (DoD)
Naval Medical Research Institute (DoD)
DARPA (DoD)
Edgewood Chemical Biological Center (ECBC) (DoD)
DTRA (DoD)
Department of Energy (DOE) laboratories
Department of Agriculture
Environmental Protection Agency
and now, even the National Institutes of Health (NIH)

The CIA can obtain any information regarding biological agents that it needs in order to carry out its legitimate activities in the sphere of U.S. national security from these other U.S. agencies or organizations. Placing molecular genetics research under the jurisdiction of the intelligence community guarantees that there will be no independent oversight of it.

In the last year or two, there have been a series of major national and international reports that have identified lines of “dual use” molecular genetics research which are particularly problematical. In essence that means that they could be misused to develop more advanced biological weapons. Each of these reports suggests that such lines of research should be subject to particular and special formal oversight by one or another mechanism, much more oversight than presently exists anywhere. Although none of these explicitly engage the question of BWC treaty compliance, it is interesting to match the nine NBACC program elements quoted earlier with the research groupings in these reports. Two German researchers, Nixdorff and Bender, were the first to produce a short compilation. In discussing “modifications of microorganisms that might have significance for bioweapons, [they] identified four classes of microbial manipulations that have been the subject of intense debate within and outside the scientific community: 1. The transfer of antibiotic resistance to microorganisms; 2. Modification of the antigenic properties of microorganisms; 3. Modification of the stability of microorganisms to the environment; and 4. The transfer of pathogenic properties to microorganisms.”²²⁴

A few months later, DoD's Defense Threat Reduction Agency convened a workshop to consider possible limitations on the publication of scientific research that "could be misused for biological warfare or terrorism." It considered research that aims to achieve one or more of six weaponization-related goals.

- Enhance pathogen infectivity, pathogenicity, antibiotic resistance, or resistance of host immunological defenses.
- Improve the ability of a microbial pathogen to remain viable and virulent during prolonged storage and/or after release into the environment.
- Facilitate the dissemination of biological agents as a fine-particle aerosol.
- Facilitate the dissemination of a biological agent by contamination of food or water sources.
- Create a novel pathogen or one with characteristics that have been altered to evade current detection methods or host immune defenses.
- Assemble oligonucleotides to synthesize the genome of a pathogenic microorganism.²²⁵

The third compilation appeared in a 2004 report prepared by a Committee of the U.S. National Academy of Sciences. The Committee identified seven classes of experiments that it believes illustrate the types of endeavors or discoveries that will require review and discussion by informed members of the scientific and medical community before they are undertaken or, if carried out, before they are published in full detail. They include experiments that:

- Would demonstrate how to render a vaccine ineffective.
- Would confer resistance to therapeutically useful antibiotics or antiviral agents.
- Would enhance the virulence of a pathogen or render a nonpathogen virulent.
- Would increase transmissibility of a pathogen.
- Would alter the host range of a pathogen.
- Would enable the evasion of diagnostic/detection modalities.
- Would enable the weaponization of a biological agent or toxin.²²⁶

In December 2004, a report of WHO included a relatively similar group of six:

- Facilitate the production of toxins that were previously difficult to acquire on a large scale;
- Make a pathogen resistant to the immune system or to antibiotic treatment, hence rendering defensive measures in effective;
- Modify the environmental stability of a pathogen;
- Create bacteria and viruses of greater virulence or render previously harmless organisms pathogenic;
- Change host specificity of microorganisms; or,
- Render the identification and detection of engineered pathogens very difficult (e.g., to bypass the current detection technologies).²²⁷

A fifth group of experimental categories were elaborated under a University of Maryland project aimed at designing a national and international mechanism for oversight of such work. It divides projects that would be considered “dangerous” into three groupings: extremely, moderately and potentially dangerous. (See Table 3 below.)

The overlap between the nine NBACC program elements quoted earlier and all of these five lists is obvious.

On April 18, 2005, the DHS proposed to categorize the NBACC facility as a Federally Funded Research and Development Center (FFRDC).²²⁸ Historically, a very large portion of the work carried out at FFRDCs, such as the Lincoln Laboratories, the Mitre Corporation, the Center for Naval Analysis, the Institute for Defense Analysis, the three U.S. Department of Energy laboratories (Los Alamos National Laboratory, Livermore National Laboratory, and Sandia National Laboratory), the RAND Corporation (Air Force), and others is classified. As of 2005, there are 37 FFRDCs altogether. In the words of a May 2005 Congressional Research Service report, “Many FFRDCs conduct research principally in classified fields for the Defense and Intelligence Communities.”²²⁹ Whether the transformation of NBACC into a FFRDC will make oversight of its work significantly more difficult than it would otherwise have been in any case, no one can say, but it probably can be assumed that it will. It is almost certain

Extremely Dangerous Activities (EDA):

- Work with eradicated agent
- Work with agent requiring Biosafety Level-4
- De novo synthesis of above
- Expanding host range of disease agent to new host (in humans, other animals and plants) or changing the tissue range of a listed agent
- Construction of antibiotic- or vaccine-resistant listed agent

Moderately Dangerous Activities (MDA):

- Increasing virulence of listed agent or related agent
- Insertion of host genes into listed agent or related agent
- Increasing transmissibility or environmental stability of listed agent or related agent
- Powder or aerosol production of listed agent or related agent
- Powder or aerosol dispersal of listed agent or related agent
- De novo synthesis of listed agent or related agent
- Construction of antibiotic- or vaccine-resistant related agent
- Genome transfer, genome replacement, or cellular reconstitution of listed agent or related agent

Potentially Dangerous Activities (PDA):

- Work with listed agent—or exempt avirulent, attenuated, or vaccine strain of select agent—not covered by EDA/MDA
- Increasing virulence of nonlisted agent
- Increasing transmissibility or environmental stability of nonlisted agent
- Powder or aerosol production of nonlisted agent
- Powder or aerosol dispersal of nonlisted agent
- De novo synthesis of nonlisted agent
- Genome transfer, genome replacement, or cellular reconstitution of nonlisted agent

Definitions

Agent: fungus, protist, rickettsia, bacterium, virus, viroid, or prion; or genetic element, recombinant nucleic acid, or recombinant organism.

Listed agent: agent on CDC Select Agent list, USDA High-Consequence Livestock Pathogens list, or USDA/APHIS/PPQ Plant Pathogens list.

Related agent: for fungi, protists, rickettsiae, or bacteria, an agent in the same genus as a listed agent; for viruses, viroids, or prions, an agent in the same family as a listed agent; for genetic elements, recombinant nucleic acids, or recombinant organisms, an agent orthologous to a listed agent. (This category includes any avirulent, attenuated, or vaccine strain of a listed agent, if said strain is exempt under the CDC Select Agent list, USDA High-Consequence Livestock Pathogens list, or USDA/APHIS/PPQ Plant Pathogens list.)

Non-listed agent: agent other than a listed agent or related agent.

Antibiotic: antibiotic of therapeutic utility against listed agent.

Vaccine: vaccine of therapeutic utility against listed agent.

Powder: powder other than lyophilized reference specimen (<10 mg.)

Table 3. Groupings.²³⁰

that all of the “threat assessment” research that it will undertake will be classified.²³¹ NBACC’s initial building cost is currently estimated at \$128 million. In addition to NBACC, the DHS has now announced plans to build a National Bio and Agrodefense Facility (NBAF) at an initial projected building cost of \$451 million. It would feature large animal BL-3 and BL-4 research capability in order to work with foreign animal diseases. The insertion of the NBAF into the DHS budget proposal was made by senior administration officials. In May 2005, the Army proposed a \$1 billion expansion to USAMRIID to be built at the National Interagency Biodefense Campus at Fort Detrick, Maryland.²³² With inevitable cost overruns by the time these three new facilities will all be completed, the infrastructure investment for them will very likely exceed \$2 billion. In addition, the U.S. Department of Agriculture is modernizing the National Animal Disease Center in Ames, Iowa, at a cost of an additional \$406 million.²³³

A new element, at least as problematic if not more so than the NBACC research program alone but certainly associated with it, is the newly announced wording by the DHS on the programmatic mission of NBACC. It clearly moves U.S. Government policy in the same – wrong – direction. The NBACC research program does so by implication; this does so in a more formal way. The DHS has apparently adopted and begun to publicly use its own novel interpretation of the provisions of Article 1 of the Biological Weapons Convention. In the FY 2006 Congressional Justification for DHS, the DHS wrote the following in discussing NBACC:

The work in these laboratories will be for defensive purposes only. *The Convention on the Prohibition of the Development, Production, and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction*, also known as the Biological and Toxin Weapons Convention (BWC), prohibits the development, production, stockpiling, and acquisition of **offensive** biological weapons. The U.S. is a signatory to this treaty, and all activities performed at the NBACC Facility will comply with this treaty and with all other applicable laws. [Emphasis added.]²³⁴

The insertion of the single word “offensive” in front of “biological weapons” is a direct contradiction of all the rest of the statement and of all existing international legal interpretations of Article 1 of the

BWC. It implies that the BWC does not prohibit the development, production, and stockpiling of “defensive” biological weapons. But, the Biological Weapons Convention does *not* distinguish between “offensive” biological weapons, and any other kind. There is no such thing as “defensive” biological weapons. Whatever military doctrine may say regarding distinctions between offensive and defensive conventional weapons, this does not apply to biological weapons. Article 1.1 of the Biological Weapons Convention (see page 71) allows the growth of laboratory quantities of pathogens (agents) for defensive purposes, that is, in order to develop vaccines and pharmaceuticals, test rapid detection systems, masks, decontamination systems and so on. However even the “development” of the pathogen is explicitly forbidden – “never in any circumstances” – as is production and stockpiling. Article 1.2 is a blanket prohibition on the development and production of “weapons, equipment, or means of delivery designed to use such agents or toxins for hostile purposes or in armed conflict.” The three qualifying words in Article 1.1 – prophylactic, protective, and peaceful – which operationally define “defensive” in the treaty do not apply to “weapons, equipment, or means of delivery” in Article 1.2.

DHS’s choice of language in its FY2006 budget request was not an accident, but a deliberate, considered decision.²³⁵ The new DHS BWC treaty interpretation first appeared in the September 17, 2004, DHS submission for comments on the Draft Environmental Impact Statement (EIS) for NBACC, and was repeated in the final EIS released by DHS on December 23, 2004. In between the two submissions the Center for Arms Control and Non-Proliferation in Washington, DC had questioned the DHS treaty interpretation, pointing out that in the 1989 Programmatic Environmental Impact Statement for the DoD Chemical and Biological Defense Program (CBDP), DoD states that the Biological Weapons Convention “makes the clear distinction between defensive and offensive efforts by identifying the development of biological weapons delivery systems as a discrete and prohibited activity.” In addition, U.S. statutory law, the 1989 implementing legislation for the Biological Weapons Convention [18U.S Code 175] makes no distinction between “offensive” and “defensive” biological weapons. DHS responded to these points by stating in its final EIS that “the DoD’s programmatic

NEPA documentation cited has been superseded.” (NEPA refers to the National Environmental Policy Act, under which federal agencies are required to provide Environmental Impact Statements.) In essence, the formal DHS response in this instance was the same as the informal comment by DHS’s Maureen McCarthy quoted earlier: that the times had changed. The DHS phrase about “superseded” brashly presumes to revoke the DoD legal commitments made in 1989, and the interpretation of Article 1 of the BWC that the U.S. Government presumably held between 1972 and certainly at least until 1989, and as best as anyone knows until 2004. The times may very well have changed, but the provisions of the Biological Weapons Convention have not, and under international law, they are not open to being changed by unilateral interpretations.

An analogous situation occurred some 20 years ago involving another arms control treaty. In the mid-1980s the Reagan administration attempted to reinterpret one of the provisions of the ABM Treaty through a memorandum—the so-called “Sofaer amendment”—written by Abraham Sofaer, Legal Advisor to the Department of State. It blandly stated that the United States could carry out a particular category of ABM testing which the ABM Treaty forbade. In that instance, the U.S. Senate took objection, stating that since it was the duty of the Senate to ratify international treaties, the Office of the President had no authority to modify the terms of the treaty once it had been ratified. Extensive Senate Hearings were held, and books and monographs were written on the subject.²³⁶ The USSR, the treaty cosignatory with the United States, also stated that it would not accept the suggested modification or the activities, and that the integrity of other U.S.-USSR strategic arms limitation agreements would be placed in jeopardy if the United States unilaterally began the testing that it proposed to do. The Reagan administration ultimately withdrew its proposed unilateral treaty modification.

These issues have certainly come to the attention of working level officials in the Foreign Ministries of at least some countries closely allied with the United States, but it is not known whether it has become a matter of private diplomatic discussion between those countries and the United States. Probably not. The subject has not been broached publicly.

The entire area of oversight of problematical “dual use” research in molecular genetics and its applications in the United States appears to range from inadequate at local levels to virtually nonexistent at the national level and in terms of BWC treaty compliance.

In the late 1970s, the NIH established a system applicable to any institution within the United States or overseas that receives any support from NIH for recombinant DNA research. That system required every such institution to establish an Institutional Biosafety Committee (IBC), and to register that IBC with the NIH Office of Biotechnology Activities. The IBCs were then to oversee projects within their own institutions following a common set of guidelines and criteria. Failure to adhere to the NIH guidelines could result in the suspension, limitation, or termination of NIH funding for recombinant research. However, this system does not apply except on a voluntary basis to a very large population of institutions that are not recipients of NIH funding, such U.S. Government biodefense laboratories and U.S. Government contractors, as well as hundreds of commercial biotechnology enterprises. For example, the Battelle Memorial Institute, a government contractor which has been carrying out Project Jefferson at least since 2001, the development of a vaccine resistant strain of anthrax to duplicate Soviet-era work, apparently has no functioning IBC, although the research is by definition recombinant DNA work.²³⁷ The Departments of Energy, Defense, and Agriculture have numerous facilities carrying out recombinant DNA research at the same time as they have no NIH-registered IBCs. No one knows how much biodefense and bioterrorism research falls entirely outside the NIH guidelines and the IBC system. In addition, a recent study demonstrated that a very large proportion of the IBCs operated in haphazard fashion or not at all.²³⁸ Some three dozen commercial entities that do receive NIH funding for biodefense research had no IBC registered with the NIH at all. Finally, the existing NIH guidelines do not currently include consideration of the security or proliferation implications of dual-use research, and it is for that reason that the National Academy of Sciences committee recommended that the seven categories of experiments of concern be added to the NIH oversight process.

In response to the recommendations of the NAS committee report, the administration announced the establishment of a National

Science Advisory Board for Biosecurity (NSABB) on March 4, 2004. Its mandate was to last for 2 years. The NSABB was established by the Department of Health and Human Services (DHHS) and is to be housed within the National Institutes of Health (NIH). The staff of the NSABB was not appointed until 11 months later in February 2005. No announcement of the membership of the Board was made until its first meeting on June 30, 2005. The responsibilities of the NSABB obviously were not seen as a significant priority by the administration. A May 30, 2005, announcement stated that "The Board is charged with advising on the development of: guidelines for the oversight of dual-use research; national policies governing the publication and communication of sensitive research results . . ." ²³⁹ The apparent notion was that the NSABB would oversee a process by which the National Academy committee's suggestions regarding experiments of "dual use" concern would be grafted on to the IBC system. The NSABB will not itself review individual research project protocols; it will only respond to requests for guidance. That the local institutional committees would perform this much more substantive task, given their highly problematic record mentioned above in dealing with much less demanding considerations, seems dubious at best. ²⁴⁰ A very similar opinion was expressed by the chairmen of six IBCs at major universities in the southeastern United States. ²⁴¹ But most importantly, the NSABB is to have *no* oversight over classified BW-relevant research, which is the location in which the most problematical dual-use research is likely to take place.

As an example of the contradictory and counterproductive nature of even current NIH funding decisions, the NIAID at NIH recently announced a grant for a researcher hoping to develop a method of countering the action of botulinum toxin. The grant recipient, Dr. Kim Janda, noted that the task would be difficult because "the neurotoxin [is] quite unstable." He would therefore be "collaborating with scientists in Wisconsin to develop a more stable form of the neurotoxin, one that is more easily studied." ²⁴² The biological weapon programs of both the United States and the USSR discovered, independently, that botulinum toxin was not a very useful biological weapon because the toxin becomes unstable with increased purification. Here was an NIH research award whose purpose was announced as "aimed

at stopping bioterrorism weapons” that was proposing to develop “a more stable form of the toxin” in order to carry out its research. However, that means preparing a much more effective botulinum toxin than had been available before, which had evaded preparation by the two largest offensive biological weapons programs in history, except in very small quantities.²⁴³

Another example is the proposal that,

Better developed animal models and studies of the aerobiological properties of filoviruses [Ebola and Marburg virus] need to be conducted – which are critical to evaluating the threat posed by filoviruses. . . . Without data, there can be little understanding of the level of threat that filoviruses present. For example, it is not clear from the available data whether filoviruses would cause large-scale infections and deaths if disseminated by aerosol over a city without extensive preparation or modification (“weaponization”).²⁴⁴

This is a perfect example of research designed to probe a potential vulnerability, threat assessment in the absence of a verified threat. As the authors clearly state in their paper, filovirus infection in nature does not occur via aerosol. The research therefore breaks new ground, and innumerable examples could be proposed all of which would, in effect, be pushing into areas that may not be justifiable.

It is clear that at the time of the three classified biodefense projects in the 1999-2001 time period, there was no U.S. Government-wide NSC-interagency process to review the compatibility of all elements of the U.S. biodefense program with Article I of the BWC. Six years later, there still is none. Even existing mandated treaty compliance frameworks, such as within the U.S. DoD, to carry out reviews of BW R&D projects did not function in the case of its own classified project in 1999-2001. DoD Directive Number 2060.1 mandated the establishment of DoD Compliance Review Groups (CRGs).²⁴⁵ An analogous directive existed in years prior to 2001. No CRG review of the DoD project (BACUS) ever took place.²⁴⁶ Whether one took place within the DIA, whose project it was, is unknown. Nor was information about the project ever brought to the attention of the National Security Council (NSC).

There is no functioning overall U.S. Government compliance oversight process today for research that impacts the BWC. DoD

continues to oppose the formation of such an NSC-level treaty compliance process.²⁴⁷ Others have suggested that a U.S. BWC compliance review process should be located in the National Academy of Sciences. That may additionally be desirable as a backstop, but it is a government function, and it belongs at the NSC level. With a second heavyweight Cabinet department, Homeland Security, reinterpreting the most critical provisions of the BWC, presumably to permit research that was heretofore considered out of bounds, the picture becomes problematical and dangerous.

The cost of a U.S. BW research program that may cross into “development,” and of potential U.S. noncompliance with the BWC, very simply means the weakening of the BWC and the international regime that stands in the way of the proliferation of BW to new states or to nonstate actors/terrorist groups. That is certainly not something that anyone who wants such proliferation halted and reversed can possibly want to happen. On May 2, 2005, the U.S. Department of State released a Fact Sheet on “United States Initiatives to Prevent Proliferation.” It described seven unquestionably desirable U.S. Government programs. It did not, however, so much as mention any of the international nonproliferation treaty regimes: the Nuclear Non-Proliferation Treaty, the Chemical Weapons Convention, or the Biological Weapon Convention. This emphasis was repeated at the end of May in statements by President George W. Bush and Secretary of State Condoleezza Rice on the occasion of the second anniversary of the U.S. Proliferation Security Initiative. The current U.S. administration does not show much sympathy for international regimes.

It is sometimes said that criticism of the United States and its policies in regard to the BWC itself weakens the Convention, and serves to give other nations that may have no interest at all in observing its provisions a cover for their own misbehavior. There appears to be no way to address major issues without introducing such risk. Caution and reconsideration only rarely take place within the government, and if the trend appears to be a deteriorating one, the issues have to be raised publicly. Unfortunately, the United States also loses a portion of its leverage to raise questions about possible questionable activities in other states.

PART VI

CONCLUSION

A summary of the material presented in this monograph produces the following conclusions:

- **Significance of the problem.** “Bioterrorism” may or may not develop into a serious concern in the future, but it is *not* “one of the most pressing problems that we have on the planet today.”
- **The evolution of state biological weapons programs.** The number of state BW programs has apparently been reduced by one-third or one-fourth in the past 15 years. The remaining number of countries appears to be stable; no compensating rise in offensive state BW programs has been identified. In addition, the U.S. Government—which has almost without exception in past decades been the only country to publicly identify WMD proliferants—appears in its most recent statements to be qualifying the status of states with presumed offensive BW programs. To date, no state is known to have assisted any nonstate or terrorist group to obtain biological weapons.
- **The evolution of nonstate/terrorist biological weapon capabilities.** The production and distribution of a dry powder anthrax product in the United States in 2001 is the most significant event. However, understanding to what degree that demonstration of competence is relevant to “traditional” terrorist groups is impossible until the perpetrator(s) of the anthrax events are identified. If it was done with assistance, materials, knowledge, access, etc., derived from the U.S. biodefense program, the implications change entirely.

The Rajneesh group (1984) succeeded in culturing *Salmonella*. The Japanese Aum Shinrikyo group failed to obtain, produce, or disperse anthrax and botulinum toxin.

The steps taken by the al-Qaida group in efforts to develop a BW program were more advanced than the United States understood prior to its occupation of Afghanistan in November-December 2001. Nevertheless, publicly available information, including the somewhat ambiguous details that appeared in the March 31, 2005, report of the Commission on Intelligence Capabilities, indicates that the group failed to obtain and work with pathogens. Should additional information become available regarding the extent to which the al-Qaida BW effort had progressed, that assessment might have to be changed.

Scenarios for national BW exercises that posit various BW agents in advanced states of preparation in the hands of terrorist groups simply disregard the requirements in knowledge and practice that such groups would need in order to work with pathogens. Unfortunately, 10 years of widely broadcast public discussion has provided such groups, at least on a general level, with suggestions as to what paths to follow. If and when a nonstate terrorist group does successfully reach the stage of working with pathogens, there is every reason to believe that it will involve classical agents, without any molecular genetic modifications. Preparing a dry powder preparation is likely to prove difficult, and dispersion to produce mass casualties equally so. Making predictions on the basis of what competent professionals may find “easy to do” has been a common error and continues to be so. The utilization of molecular genetic technology by such groups is still further off in time. No serious military threat assessment imputes to opponents capabilities that they do not have. There is no justification for imputing to real world terrorist groups capabilities in the biological sciences that they do not possess.

- **Framing “the threat” and setting the agenda of public perceptions and policy prescriptions.** For the past decade the risk and immanence of the use of biological agents by nonstate actors/terrorist organizations — “bioterrorism” — has been systematically and deliberately exaggerated. It became more so after the combination of the 9/11 events and the October-November 2001 anthrax distribution in the United States that

followed immediately afterwards. U.S. Government officials worked hard to spread their view to other countries. An edifice of institutes, programs, conferences, and publicists has grown up which continue the exaggeration and scare-mongering. In the last year or two, the drumbeat had picked up. It may however become moderated by the more realistic assessment of the likelihood of the onset of a natural flu pandemic, and the accompanying realization that the U.S. Government has been using the overwhelming proportion of its relevant resources to prepare for the wrong contingency.

Others see exaggeration as necessary in order to prompt preparation. They acknowledge the exaggeration but argue that political action, the expenditure of public funds for bioterrorism prevention and response programs, will not occur without it. "Bioterrorism" may come someday if societies survive all their other impending crises. However, the persistent exaggeration is not benign: it is almost certainly the single greatest factor in provoking interest in BW among terrorist groups, to the degree that it currently exists, for example, in the al-Qaida organization. Precisely this occurred: Their most senior leadership was provoked by statements regarding bioterrorism and its supposed ease by U.S. officials in 1996-97.

- **Costs of the U.S. biodefense program.** On the grounds of "necessity," the U.S. biodefense research program appears to be drifting into violation of Article 1 of the BWC. There is little question but that U.S. officials would make that judgment of any other nation's biodefense program in which the same kind of work was being carried out as is taking place and is planned by U.S. agencies, or in the case that agencies of another government put forward reinterpretations of the provisions of Article 1 of the BWC so as to imply that work could be done on "defensive" biological weapons. A national-level oversight system to see that BWC compliance is maintained by all projects of the U.S. biodefense program – unclassified, classified, and perhaps yet other "black" projects – does not exist. Should the BWC be weakened further and if other state

programs begin to go down the same research path as the U.S. biodefense program, together with any eventual recourse to BW by nonstate actors, the international regime against the development of biological weapons may be irrevocably damaged.

Policy Recommendations.

The policy recommendations derive directly from the analysis presented in the study, and fall into two groups: 1) threat assessment, and 2) U.S. biodefense program oversight.

Recommendation 1: A thorough national BW threat assessment is necessary, to the degree that the best available information permits. It should be based on the realities of state and nonstate actor capabilities, rather than on hypothetical projections of technological state-of-the-art.

Recommendation 2: Government officials should avoid, and where necessary correct, exaggerated portrayals of the biological weapons threat. Such exaggeration, even if seen as politically useful by some, runs counter to the national interest by stimulating the interest of others in BW development.

Recommendation 3: Federal expenditures for Bioshield I and II—to procure vaccines against BW “select agents”—would very likely be of far greater benefit to the U.S. public if they were redirected to procuring vaccines against pandemic flu strains. Such reconsideration and redirection should be an urgent executive and legislative priority.

Recommendation 4: The U.S. Government should make every effort to strengthen the Biological Weapons Convention, the international treaty regime whose essential purpose it is to maintain the norm against the proliferation of BW. It should do nothing to damage it or reduce its stature or relevance.

Recommendation 5: A serious national policy of oversight for the U.S. biodefense research program is necessary:

- Above all, oversight should exist at the level of the National Security Council.
- The Department of Defense should see that its relevant Compliance Review Group is functional.
- The Department of Homeland Security should institute a similar group to monitor the compliance of the work program of the National Biodefense Analysis and Countermeasures Center (NBACC) with the provisions of the Biological Weapons Convention.
- Authority to explicitly review international treaty compliance of all programs carried out by NBACC should additionally be extended to the Committee on Biodefense Analysis and Countermeasures of the National Research Council. Most desirable would be an advisory group of the stature of the President's Science Advisory Council of the 1960s. Review panels with members selected from in-house laboratories and federal contractors are unlikely to provide a critical review.
- The National Science Advisory Board for Biosecurity (NSABB) should be provided with authorization to include classified biodefense research programs under its jurisdiction.

ENDNOTES

1. "US Senate Leader Urges 'Manhattan Project' Against Bio-Terror Threat," Agence France Presse, January 27, 2005. It is clear from other statements by Senator Frist roughly at the same time that his reference in January 2005 to "biological" referred to "bioterrorism" and not to any other biological problem or context. Senator Richard Lugar previously had used the phrase that terrorists armed with WMD present an "existential" threat to the United States, and Senator Frist presumably adopted that word to deal with "bioterrorism" alone. Very similar phrasing to Senator Lugar's was also used by President Bush in an address at the National Defense University on February 11, 2004 (except that he expanded the threat from the United States to "humanity"): "The greatest threat before humanity today is the possibility of secret and sudden attack with chemical, or biological, or nuclear weapons."

2. *Ibid.*

3. On March 15, 2005, Britain's Finance Minister, Gordon Brown, stated that "human-made climate change is the most far-reaching and almost certainly the most threatening of all the environmental challenges facing us. Problems from soil erosion to the depletion of marine stocks threaten future economic activity and growth." Heather Timmons, "Climate Change is Called Economic Threat at Talks," *New York Times*, March 15, 2005. See also Jeremy Lovell, "Photos Show Climate Change; Ministers Meet in UK," *Reuters*, March 14, 2005. A report released on March 14, 2005, reported on greatly increased glacial melting in the Himalayas. This will introduce an additional regional aspect: at first, increased flooding followed by decades of drought as traditional agricultural water sources disappear. This will severely reduce food crop production for hundreds of millions of people. See World Wildlife Fund, *An Overview of Glaciers: Glacier Retreat and Subsequent Impacts in Nepal, India, and China*, WWF Nepal Region, March 2005. One of the most useful general surveys remains *The Global 2000 Report to the President: Volume I. Entering the Twenty-First Century*, and *Volume II: The Technical Report*, a Report Prepared by the U.S. Council on Environmental Quality and the U.S. Department of State, 1980. In addition, the annual *State of the World* volumes produced by the Worldwatch Institute and published by W. W. Norton and Company are an invaluable resource.

4. See the Millennium Ecosystem Assessment. A brief press summary appears in Shankar Vedantam, "Report on Global Ecosystems Calls for Radical Changes. Earth's Sustainability is Not Guaranteed Unless Action is Taken to Protect Resources, Experts Say," *Washington Post*, March 30, 2005.

5. Milton Leitenberg, *Deaths in Wars and Conflicts Between 1945 and 2000*, Occasional Paper No. 29, Ithaca, NY: Cornell University, Peace Studies Program, 2003. A revised second edition of the monograph is available on the website of the Cornell University Peace Studies Program. These sums include mass domestic slaughters and politically-determined starvation in the absence of civil war as occurred in the USSR and in China during the 20th century.

6. Jeffrey Sachs, *The End of Poverty: Economic Possibilities for Our Time*, New York: Penguin Group (USA), 2005; "Thousands Died in Africa Yesterday" [Editorial], *New York Times*, February 27, 20005.

7. Gregory F. Treverton and Seth G. Jones, "Measuring National Power," RAND Corporation, National Security Research Division, 2005, p. 6.

8. Jerome C. Glenn and Theodore J. Gordon, *1999 State of the Future: Challenges We Face at the Millennium*, Washington, DC: American Council For the United Nations University, The Millennium Project, 1999.

9. Stephen J. Lukasik, *et al.*, *Protecting Critical Infrastructure Against Cyber-Attack*, Adelphi Paper No. 359, London: International Institute of Strategic Studies, 2003; Gabriel Weimann, "Cyberterrorism: How Real is the Threat," Special Report No. 119, Washington, DC: U.S. Institute of Peace, May 2004; Justin Blum, "Hackers Target U.S. Power Grid; Government Quietly Warns Utilities to Beef Up Their Computer Security," *Washington Post*, March 8 or 9, 2005; Jacques S. Gansler and Hans Binnendijk, eds., *Information Assurance: Trends in Vulnerabilities, Threats and Technologies*, Washington, DC: National Defense University, 2004; Jacques Gansler, "Protecting Cyberspace," in Hans Binnendijk, ed., *Transforming America's Military*, Washington, DC: National Defense University, 2002, pp. 331-344; *DOD Information Security: Serious Weaknesses Continue to Place Operations at Risk*, GAO/AIMD-99-107, Washington, DC: U.S. General Accountability Office, August 1999; and Clay Wilson, *Computer Attack and Cyberterrorism: Vulnerabilities and Policy Issues for Congress*, RL32114, Washington, DC: Congressional Research Service, The Library of Congress, April 1, 2005.

10. *Information Security: Computer Attacks at Department of Defense Pose Increasing Risks*, GAO/AIMD-96-84, Washington, DC: U.S. General Accountability Office, May 1996.

11. "Nuclear terrorism is the biggest concern that we face. The threat is real, and the worst possible threat we could ever imagine," Wesley Mark, the University of Toronto, cited in Estanislao Oziewicz, "Arms Strategy at Center of Discussion on UN Reform," *The Globe and Mail*, April 6, 2005. See also John Mintz, "US Called Unprepared for Nuclear Terrorism. Experts Critical of Evacuation Plans," *Washington Post*, May 3, 2005. Colonel Randall Larson (Ret.) paired biological terrorism with nuclear terrorism, and stated that these "... are the only existential threats we face." Randall J. Larsen, "Years After 9/11 ... No One Is In Charge of Fighting Our Two Biggest Threats," *Washington Post*, May 20, 2005. Colonel Larsen is Director of the newly formed Institute for Homeland Security.

12. Dr. Keith Krause, Small Arms Survey Project, Geneva, cited in Oziewicz.

13. "Terrorist Attacks on Reactor Pools," *New York Times*, April 8, 2005, reporting on a study released by the U.S. National Academy of Sciences.

14. Guy Gugliotta, "Science's Doomsday Team vs. the Asteroids," *Washington Post*, April 9, 2005.

15. Jon Kyl, "Unready for this Attack," *Washington Post*, April 16, 2005.

16. "Chemical Weapons: No. 1 Threat," SA/Malaysia newswire, May 19, 2005.

17. Josh Ruxin, *et al.*, "Emerging Consensus in HIV/AIDS, Malaria, Tuberculosis, and Access to Essential Medicines," *The Lancet*, Vol. 365, February 12, 2005, pp. 618-621. HIV, the disease agent of AIDS, kills by compromising the human immune system. It is therefore more accurate to refer to "AIDS-related illnesses," and the infected individual is ultimately killed by secondary infections. In many countries, particularly in Africa, that disease is often tuberculosis or malaria; nevertheless, the figures are customarily presented as indicated. These figures also represent the number of deaths *reported* by hospitals and clinics. Available statistics therefore are probably conservative estimates and underestimate true totals due to lack of reliable diagnostic or reporting capabilities in many third world countries. The actual numbers are therefore likely to be higher.

18. Robert W. Snow, *et al.*, "Malaria: A World View. The Global Distribution of Clinical Episodes of *Plasmodium Falciparum* Malaria," *Nature*, Vol. 434, March 10, 2005, pp. 214-217; and "Malaria Estimated at 515 Million Cases Worldwide," Reuters Foundation AlertNet. See also *One in Two: Children Are The Key to Africa's Future*, Save the Children, 2005; and "Africa: Report Highlights Plight of African Children," Irin News, UN Office for the Coordination of Humanitarian Affairs, March 14, 2005. At least one in six children in Sub-Saharan Africa die before the age of five, compared to one in 140 in developed countries. Another major killer is pneumonia, which is also treatable.

19. The White House, Office of Science and Technology Policy, *Fact Sheet: Addressing the Threat of Emerging Infectious Diseases*, June 12, 1996.

20. National Intelligence Council, *National Intelligence Estimate: The Global Infectious Disease Threat and Its Implications for the United States*, NIE-99-17D, January 2000.

21. World Health Organization statistics, 2002.

22. Marc Kaufman, "Global Tobacco Control Pact Takes Effect," *Washington Post*, February 27, 2005; and "Worldwide Anti-Tobacco Treaty," *New York Times*, February 27, 2005.

23. Lawrence K. Altman, "U.N. Optimistic About Halving Measles Deaths," *New York Times*, March 4, 2005.

24. "Containing Deadly Outbreaks," Doctors Without Borders, Appeal Campaign brochure, March 2005.

25. The chart appears at www.globalaging.org/health/us/fluuids.htm. See also Keiji Fukuda, Centers for Disease Control, reported in the *Journal of the American Medical Association*, January 8, 2003.

26. R. J. Webby and R. G. Webster, "Are We Ready for Pandemic Influenza," *Science*, Vol. 302, November 28, 2003, pp. 1519-1522.

27. John Barry, *The Great Influenza: The Epic Story of the Deadliest Plague in History*, London: Penguin, 2005; and Gina Kolata, *Flu: The Story of the Great*

Influenza Pandemic, New York: Farrer, Straus, and Giroux, 1999. It is interesting how frequently policymakers and the public appear to have little or no notion of comparative statistics bearing on public health. In his book, Barry notes that "Influenza killed more people in a year than the Black Death of the Middle Ages killed in a century; it killed more people in 24 weeks than AIDS has killed in 24 years." On the other hand, antibiotic resistant hospital infections kill an estimated 103,000 people in the United States each year – reportedly more than AIDS, breast cancer and auto accidents combined. In 10 years that amounts to 1 million dead in the United States. These deaths can be prevented or drastically reduced by easily instituted hospital procedures. Betsy McCaughey, "Coming Clean," *New York Times*, June 6, 2005.

28. "Governments in a Dilemma Over Bird Flu," *In Focus*, World Health Organization, May 1, 2005.

29. Charles Piller, "Many Scientists Fear Bird Flu Cases Exceed Data," *Los Angeles Times*, March 16, 2005; Lawrence K. Altman, "True Toll of Avian Flu Remains a Mystery," *New York Times*, March 15, 2005; and Elisabeth Rosenthal, "Experts Doubt Bird Flu Tallies from China and Elsewhere," *New York Times*, December 2, 2005.

30. "Bird Flu Called Global Human Threat; Asia Outbreak Poses 'Gravest Possible Danger,' UN Official Says, Urgent Controls," *Washington Post*, February 24, 2005; Darren Schuettler, "World Must Act Now or Face Pandemic – UN," *Boston Globe*, February 23, 2005; Charles Piller and Thomas H. Maugh, "Poultry Farming Reform Urged to Curb Bird Flu," *The Los Angeles Times*, February 24, 2005; Charles Piller, "Bird Flu Spate Signals Easier Transmission; Outbreaks That Killed 12 in Southeast Asia Raise Fears of a Mutated Virus Spread by Humans," *Los Angeles Times*, February 1, 2005; Alan Sipress, "As SE Asian Farms Boom, Stage Set for a Pandemic; Conditions Ripe for Spread of Bird Flu," *Washington Post*, February 5, 2005.

31. Maggie Fox, "Avian Flu World's No. 1 Threat, CDC Head Says," Reuters, February 21, 2005.

32. Scott Shane, "U.S. Germ-Research Policy Is Protested by 758 Scientists," *New York Times*, March 1, 2005. It should be noted that Senator Frist's quoted reference to a "biological" threat, consistent with all his analogous statements, referred to bioterrorism *only*; it did not refer to or include pandemic flu. More recently he has combined the two.

33. Program of the 2005 American Society for Microbiology, www.asmbiodefense.org/program.asp.

34. "WHO Inter-Country Consultation; Influenza A/H5N1 in Humans in Asia," Manila, May 6-7, 2005. There are strong indications that the incidence of H5N1 infection in Vietnam and Thailand were being underreported deliberately as well as due to asymptomatic flu infections. For an example of the latter, see Menno D. De Jong, *et al.*, "Fatal Avian Influenza A (H5N1) in a Child Presenting with Diarrhea Followed by Coma," *New England Journal of Medicine*, Vol. 352, No. 7, February 17, 2005, pp. 686-691.

35. Pallab Ghosh, "WHO to Warn on Changing Avian Flu," BBC, May 18, 2005, reported on the BBC News on May 22, 2005; and Amy Kazmin, "WHO Warns Mutation of Bird Flu Virus Increases Risk of Pandemic," *Financial Times*, May 23, 2005.

36. Dr. Craig Venter, Testimony to Hearing of the U.S. Senate Committee on Health, Education, Labor and Pensions, "21st Century Biological Threats," May 11, 2005.

37. Ron Fouchier, *et al.*, "Global Task Force for Influenza," *Nature*, Vol. 435, May 26, 2005, pp. 419-420. In reporting the *Nature* story, the BBC repeated the very much higher figure, of a possible mortality of hundreds of millions of people.

38. Michael T. Osterholm, "Preparing for the Next Pandemic," *Foreign Affairs*, Vol. 84, No. 4, July-August 2005. Dr. Collwells' estimate was given at a conference held at the MITRE Corporation, McLean, VA, June 29, 2005.

39. The CDC budget for influenza was an additional \$179 million. Maggie Fox, "US Unprepared Against New Flu: Experts," *Reuters*, May 26, 2005.

40. Dan Gillmor, "Specter of Flu Pandemic Fails to Jog Government," *San Jose Mercury News*, and *Twincities.com*, December 17, 2004.

41. Appendices are available at www.sciencemag.org/cgi/content/full/307/5714/1409c/DC1.

42. *Breathing Easier: Report of the Century Foundation Working Group on Bioterrorism Preparedness*, New York: The Century Foundation Press, 2003, p. 1.

43. *Combating Terrorism: Need for Comprehensive Threat and Risk Assessment of Chemical and Biological Attacks*, GAO/NSIAD-99-163, Washington, DC: U.S. Government Accountability office, September 7, 1999.

44. *Estimates on Soviet Military Power, 1954-1984: A Selection*, compiled by Donald P. Steury, Washington, DC: History Staff, Center for the Study of Intelligence, CIA, 1994; and Donald P. Steury, ed., *Intentions and Capabilities: Estimates on Soviet Strategic Forces, 1950-1983*, Washington, DC: History Staff, Center for the Study of Intelligence, CIA, 1996.

45. See Milton Leitenberg, *The Problem of Biological Weapons*, Stockholm, Sweden: The Swedish National Defense College, 2004, p. 13.

46. Editorial: "Biological Weapons Inspections," *Voice of America*, October 1996. As noted elsewhere, exactly what the words "capability" or "capacity" means in this context in U.S. Government statements is never clearly defined.

47. Chandré Gould and Peter Folb, *Project Coast: Apartheid's Chemical and Biological Warfare Programme*, Geneva: United Nations Institute for Disarmament Research, 2002.

48. "Remarks by John R. Bolton, Undersecretary of State for Arms Control and International Security, to the Second Global Conference on Nuclear, Bio/Chem Terrorism: Mitigation and Response," November 1, 2002.

49. For earlier examples of U.S. assessments of the status of Libya's BW program, see Milton Leitenberg, "Biological Weapons and Arms Control," *Contemporary Security Policy*, Vol. 17, No. 1, April 1996, pp. 1-78, particularly p. 38. The Russian statement appears in *Proliferation Issues: Russian Foreign Intelligence Service Report*, in JPRS-TND-93-007, May 4, 1993, p. 24.

50. White House Office of the Press Secretary, "Press Background Briefing by Senior Administration Officials," December 19, 2003. Also, personal briefings by U.S. NSC official, April 15, 2004, and U.S. Department of State official, May 2004.

51. Methods of WMD intelligence include overhead reconnaissance of several different kinds (photo, MASINT, etc.), electronic intercepts, procurement monitoring, and human intelligence. However, the Iraq experience demonstrated that the last of these, human intelligence, could be catastrophically compromised by concocted information deliberately passed to multiple Western intelligence agencies by politically motivated opposition groups. Precisely that occurred to both U.S. and British intelligence agencies in the pre-Iraq war period.

52. The official title of the final report of the Iraq Survey Group is *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD*, September 30, 2004.

53. The reports of the 9/11 Commission, the Senate Select Committee on Intelligence, and the Presidential Commission on Intelligence Capabilities all demonstrate a literally unbelievable mishandling by members of the intelligence community of the testimony of the Iraqi defector codenamed "Curveball," to the point of outright lying by Agency staff. Contrary and more accurate assessments by other sectors of the intelligence community were routinely rejected.

54. For a detailed discussion of the charges against Cuba and of Cuba's actual relevant capabilities, see Leitenberg, *The Problem of Biological Weapons*, pp. 160-163, 169.

55. U.S. CIA, "Unclassified Report to Congress on the Acquisition of Technology Relating to Weapons of Mass Destruction and Advanced Conventional Munitions, 1 July Through 31 December 2003." The statement for Libya in the same document reads:

Biological. Libya disclosed past intentions to acquire equipment and develop capabilities related to biological warfare, but it remains unclear if these activities were offensive or defensive in nature. At the team's request, Libya took us to a number of civilian medical, biotechnical, and agricultural-related research centers that have a "dual-use" potential to support BW-related work. The team was given access to scientists at these facilities.

A useful recent review of the North Korean BW program appears in *North Korea's Weapons Programmes: A Net Assessment*, London: International Institute of Strategic Studies, 2003, chapter on North Korea's Chemical and Biological (CBW) Programmes, pp. 29-62. A similar Institute for International Strategic Studies (IISS) volume on Iran is forthcoming, and it, too, will contain a section on the Iranian BW program.

56. Testimony of CIA Director Porter Goss, to the Senate Armed Services Committee Hearing on Future Threats to U.S. National Security, March 17, 2005.
57. Iranian CBM Submission to the BTWC, 2002.
58. U.S. Department of State, Bureau of Verification, *Adherence to and Compliance with Arms Control and Nonproliferation Agreement and Commitments*, found at www.state.gov/t/oc/rls/rpt/22322.htm.
59. John A. Lauder, Unclassified Statement for the Record on the Worldwide WMD Threat to the Commission to Assess the Organization of the Federal Government to Combat Proliferation of Weapons of Mass Destruction, as prepared for delivery on April 29, 1999.
60. *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD*, September 30, 2004.
61. Only in the case of Cuba has it been possible to obtain several examples of defector information that was presumably also reaching U.S. intelligence agencies. In several instances, these were forwarded to the author by the *Miami Herald*, in another case by the former director of Radio Martí. Some information also appears in the book by the most senior political defector from Cuba, José Luis Llovio-Menendez, *Insider: My Hidden Life as Revolutionary in Cuba*, New York: Bantam Books, 1988.
62. Douglas Jehl, "US Intelligence Review is Softening Some Judgments about Illicit Arms Abroad," *New York Times*, November 18, 2003.
63. National Council of Resistance of Iran Press Briefing, Subject: Iranian Regime's Programs for Biological and Microbial Weapons, Alireza Jafarzadeh and Soona Samsani, Washington, DC, May 15, 2003; and Joby Warrick, "Iran Said to be Producing Bioweapons. Opposition Group Names Anthrax as First of Six Pathogens in Intensive Effort," *Washington Post*, May 15, 2003.
64. Douglas Jehl and Eric Schmitt, "Data is Lacking on Iran's Arms, U.S. Panel Says. Intelligence on Nuclear Intentions Questioned," *Washington Post*, March 9, 2005.
65. *Defense Research: Protecting Sensitive Data and Materials at 10 Chemical and Biological Laboratories*, Appendix III, "Foreign Visitor Documentation That GAO Reviewed (June 1989 through June 1990)," GAO/NSIAD-91-57, Washington, DC: U.S. General Accountability Office, p. 21. For the 2-year period covered, there were 33 visitors from the UK, followed by 28 from Israel. The next highest numbers of visitors from any one country were 11, 10, and 8. Efforts made around 1994-95 to obtain additional data from USAMRIID for the years that followed proved unsuccessful.
66. Brad Roberts, "The Outpacing of Negotiations by Circumstance," in K. M. Jensen and David Wurmser, eds., *Is It Feasible to Negotiate Chemical and Biological Arms Control*, Washington, DC: United States Institute of Peace, 1990, p. 46. For years during the 1990s Roberts repeatedly disregarded official U.S. Government estimates and exaggerated the number of states that had offensive biological weapons programs.

67. Testimony of Elisa Harris in *Global Spread of Chemical and Biological Weapons*, Hearings before the Committee on Governmental Affairs, Permanent Subcommittee on Investigations, U.S. Senate, February 9, 1989, Senate Hearing #101-744, Washington, DC: U.S. Government Printing Office, 1989, pp. 55-59, 267-281, 605-629. See also Leitenberg, *The Problem of Biological Weapons*, p. 13.

68. *Adherence To And Compliance With Arms Control And Nonproliferation Agreements and Commitments*, U.S. Department of State, August 2005. Eight countries were discussed in the "Biological" section, and only five in the "Chemical" section, an inversion in the number of states usually described as maintaining offensive programs in the two respective categories.

69. Chandré Gould and Peter Folb, *Project Coast: Apartheid's Chemical and Biological Warfare Programme*, Geneva: United Nations Institute for Disarmament Research, 2002.

70. *Addendums to the Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD*, March 2005, p. 3. See also pp. 2 and 36. There is reported to be information available regarding the move of some Iraqi CW weapons scientists to Syria in 1994, and perhaps further details regarding this may appear in the future.

71. UN Security Council, "Twentieth Quarterly Report on the Activities of the United Nations Monitoring and Verification and Inspection Commission in Accordance with Paragraph 12 of Security Council Resolution 1284 (1999)," S/2005/129, February 28, 2005, pp. 4-5.

72. "Transcript of Screening and Discussion of the Atlantic Storm War Game: Lessons for Smallpox and Influenza," Council on Foreign Relations, New York City, June 7, 2005. Dr. Henderson's remarks are typical of his style of presentation.

73. More detailed discussion for the early portions of this section is to be found in Leitenberg, *The Problem of Biological Weapons*, Part I, Section 3, "The Experience of the Use of Biological Weapons by Non State Groups," pp. 25-35.

74. Harvey J. McGeorge, "Chemical and Biological Terrorism," Briefing Document, Public Safety Group, Woodbridge, VA, April 1996. See also Harvey J. McGeorge, "Chemical and Biological Terrorism: Analyzing the Problem," *The ASA [Applied Science & Analysis] Newsletter*, No. 42, June 16, 1994, pp. 1, 13-14. At a conference in Croatia in 2001, McGeorge reported on an updated compendium of 404 incidents involving either "chemical or biological agents." However, this group also included "threatened use," without any indications of whether real C or B agents were in the possession of those making the threats.

75. Ron Purver, *Chemical and Biological Terrorism: The Threat According to the Open Literature*, Ottawa, Canada: Canadian Security Intelligence Service, June 1995.

76. Bruce Hoffman, "The Debate over the Future Terrorist Use of Chemical, Biological, Radiological, and Nuclear Weapons," pp. 207-224, in *Hype or Reality: The "New Terrorism" and Mass Casualty Attacks*, B. Roberts, ed., Alexandria, VA: Chemical and Biological Arms Control Institute (CBACI), 2000.

77. W. Seth Carus, *Bioterrorism and Biocrimes: The Illicit Use of Biological Agents in the 20th Century*, Washington, DC: National Defense University, August 1998, updated to February 2001.

78. Jonathan B. Tucker and Amy Sands, "An Unlikely Threat," *Bulletin of the Atomic Scientists*, Vol. 55, No. 4, July-August 1999, pp. 46-52.

79. For example, a U.S. Defense Science Board Summer Study in 1997 referred to a particular hoax that had taken place in Washington, DC, as a demonstration of "the breadth of the weaponry" available to terrorist groups.

80. See Leitenberg, *The Problem of Biological Weapons*, pp. 27-29. A more detailed description of the efforts of the Aum group to produce biological agents is now available in three publications by Milton Leitenberg; "The Experience of the Japanese Aum Shinrikyo Group and Biological Agents," in *Hype or Reality*, pp. 159-172; "Aum Shinrikyo's Efforts to Produce Biological Weapons: A Case Study in the Serial Propagation of Misinformation," pp. 149-158, in Max Taylor and John Horgan, ed., *The Future of Terrorism*, London: Frank Cass, 2000; and "Aum Shinrikyo's Efforts to Produce Biological Weapons: A Case Study in the Serial Propagation of Misinformation," *Terrorism and Political Violence* [Special Issue on the Future of Terrorism], Vol. 11, No. 4, Winter 1999, pp. 149-158.

It has been known for several years that the Aum group was only able to obtain a harmless vaccine strain (Sterne) of anthrax. It had been assumed that they had not been capable of isolating botulinum toxin from the organism. Although it has been known in Japan since 1996-1997, it has only now become clear to observers in the U.S. that the Aum group did not possess *any* strain of *Clostridium botulinum* to work with. This is documented in further detail in a presentation by the author to the National Academy of Science Forum on Microbial Threats on October 25, 2005. See www.iom.edu/file.asp?id=30831.

81. Spellings of the organization's name very widely, Al or al-Qaida, Al or al-Qaida, and with or without a dash following the "Al" or "al," in addition to several other spellings. This report uses the spelling that has been most widely adopted by U.S. sources, which is not the spelling found in papers written by specialists in Arab affairs. Spellings within quotations were left as they appeared in the original source.

82. Jonathan Tucker, ed., *Toxic Terror: Assessing Terrorist Use of Chemical and Biological Weapons*, Cambridge, MA: Massachusetts Institute of Technology Press, 1999.

83. John Parachini, ed., *Motives, Means, and Mayhem: Terrorist Acquisition and Use of Unconventional Weapons*, Washington, DC: RAND Corporation, 2005, forthcoming. Groups that were surveyed in this second set of case studies include the Tamil Elam, Sri Lanka; FARC, Colombia; IRA, Northern Ireland; Hamas, West Bank; AIG, Kashmir; and several others. Some preliminary judgments from the case studies appear in John Parachini, "Putting WMD Terrorism Into Perspective," *The Washington Quarterly*, Vol. 26, No. 4, Autumn 2003, pp. 37-50.

84. John Parachini, "Putting WMD Terrorism into Perspective," *The Washington Quarterly*, Vol. 26, No. 4, Autumn 2003, pp. 37-50.

85. Dr. Yoram Schweitzer, "Al-Qaida, 9/11 and Unconventional Means: Changes in Terrorists' Mindsets and Effects on their Modus Operandi," presented at the "Conference on Meeting the Challenges of Bioterrorism: Assessing the Threat and Designing Biodefense Strategies," April 22-23, 2005, Furigen, Switzerland.

86. Dr. Jeffrey D. Simon, "Terrorists and the Potential Use of Biological Weapons: A Discussion of Possibilities," RAND Paper R-3771 AFMIC, December 1989.

87. *Mapping the Global Future: Report of the National Intelligence Council's 2020 Project*, NIC 2004-13, December 2004.

88. Dr. Stephen S. Morse, Presentation: "Bioterror R&D: Assessing the Threat," National Academy of Sciences, Washington, DC, January 9, 2003.

89. All three presentations were made on February 16, 2005, at the Hearing on "The World Wide Threat," U.S. Senate, Select Committee on Intelligence. The individual presentations are available on the Committee's website at *intelligence.senate.gov/index.htm*, and the quoted sentences appear in Goss, p. 2; Mueller, pp. 3-4; and Loy, p. 3.

90. Vice Admiral Lowell E. Jacoby, "Current and Projected National Security Threats to the United States," presentation to the U.S. Senate Armed Services Committee hearing on future threats to U.S. national security, March 17, 2005.

91. Don Van Natta, Jr., "Who is Abu Musab al-Zarqawi," *New York Times*, October 10, 2004.

92. Personal communication, George Smith, Global Security, end-2004, and March 15, 2005. A written report appears on the Global Security website.

93. "Second Report of the Analytical Support and Sanctions Monitoring Team Appointed Pursuant to Resolution 1526, 20024, Concerning Al-Qaida and the Taliban and Associated Individuals and Entities," S/2005/83, February 15, 2005, Box 6, p. 38. The UN report supported the statement with the following footnote: "In January 2003, an attempt to commit a biological attack in the United Kingdom was stopped by an intelligence-led operation conducted jointly by the Metropolitan Police Anti-Terrorist Branch, the Metropolitan Police Service Special Branch, and the Security Service. Officers arrested seven persons and seized a quantity of suspect material which was found to contain Ricin." This information is incorrect and long out of date.

94. George Smith, "More UK Terror Trial: Evil Foiled or More Mendacity," National Security Notes, *GlobalSecurity.org*, April 13, 2005.

95. George Smith, "Playtime Recipes for Poisons: The Bourgass Notes of Mass Exaggeration," National Security Notes, *GlobalSecurity.org*, April 18, 2005.

96. Alan Cowell, "Just One of 9 Suspects Convicted in 2003 British Poison Plot Case," *New York Times*, April 14, 2005.

97. James B. Petro and David A. Relman, "Understanding Threats to Scientific Openness," *Science*, 203, December 12, 2003, p. 1898. Dr. Petro at the time was in the U.S. DIA, and Dr. Relman is at Stanford University.

98. "Operation Enduring Freedom – Afghanistan," *GlobalSecurity.org*; "Taliban Surrender Last Stronghold," BBC: World, December 7, 2001. It appears that Dr. Al-Zawahiri drew up a list of publications that he wanted to read after reading a book about BW, and on April 15, 1999, al-Zawahiri asked Muhammad Atef, the No. 3 ranked official in al-Qaida, "Perhaps you can find someone to obtain them . . ." It seems possible that the book was one of the SIPRI CBW volumes, probably volume 2, *CB Weapons Today*, 1973.

99. A facilitated declassification request was made on February 23, 2004, and the declassification letter from the DIA to the author was dated March 25, 2004.

100. Tom Shanker, "US Analysts Find No Sign That Bin Laden Had Nuclear Arms: Captured Evidence Cited; Swindlers on the Black Market May Have Duped Al-Qaida with Bogus Substances," *New York Times*, February 26, 2002.

101. George J. Tenet, Director of Central Intelligence, "Worldwide Threat—Converging Dangers in a Post 9/11 World," Testimony to the U.S. Senate, Committee on Armed Services, *The Worldwide Threat to United States Interest*, 107th Congress, 2nd Session, March 19, 2002, p. 10. The same statement is presented annually to the Senate Select Committee on Intelligence.

102. George J. Tenet, Director of Central Intelligence, Testimony, U.S. Senate, Committee on Armed Services, Hearing: *Current and Future Worldwide Threats to the National Security of the United States*, 108th Congress, 1st Session, February 12, 2003, pp. 13 and 7.

103. Vice Admiral Lowell E. Jacoby, Director, DIA, "Current and Projected National Security Threats to the United States," Senate Select Committee on Intelligence, February 24, 2004, pp. 3, 8.

104. George J. Tenet, "The Worldwide Threat 2004: Challenges in a Changing Global Context," Senate Select Committee on Intelligence, February 24, 2004, p. 4.

105. *The 9/11 Commission Report*, June 17, 2004, p. 151 and footnote #23.

106. Barton Gellman, "Al-Qaida Near Biological, Chemical Arms Production," *Washington Post*, March 23, 2003.

107. Susan Schmidt and Ellen Nakashima, "Moussaoui Said Not to be Part of 9/11 Plot," *Washington Post*, March 28, 2003.

108. Mark Fineman and Bob Drogin, "Terror: In Malaysia a Jailed Cal State Graduate Helps Unravel Al-Qaida's Southeast Asia Network," *Los Angeles Times*, February 2, 2002; Jack Kelley, "Malaysia Site of September 11 Plotting, FBI Report Says," *USA Today*, January 30, 2002.

109. "Al-Qaida Agents Reveal Their Hunt for Anthrax," *The Straights Time*, Singapore, October 13, and October 14, 2003. The reports were aired by CBS and CNN.

110. "Is al-Qaida Making Anthrax," CBS News, October 9, 2003; Maria Ressa, "Reports: Al-Qaida Operative Sought Anthrax," CNN, October 10, 2003; "Qaida Man Discloses Anthrax Plan," *New York Post*, October 10, 2003; Lincoln Wright, "Hambali's Taunt: We'll Kill Again," *Herald Sun*, October 12, 2003.

111. Rohan Sullivan, "Afghan War Curbs al-Qaida Arms Program," Associated Press, January 26, 2004; and Cam Simpson, "US Seeks Access to Al-Qaida Suspect: Malaysian Man's Possible Release Adds to Urgency," *Chicago Tribune*, December 7, 2003.

112. Luz Baguioro, "Raid on Hideout Raises Fears of JI Bio-terror Plans," *Straits Times*, October 20, 2003; Luz Baguioro, "Manila Quells Bio-Weapons Fears; Residues in JI Hideout Were for Bombs," October 21, 2003; "Philippines Says No Bio-Chem Traces at JI Hideout," AlertNet, October 22, 2003.

113. Personal communication, May 2, 2005.

114. Alan Cullison, "Inside al-Qaida's Hard Drive," *Atlantic Monthly*, Vol. 294, No. 2, 2004; Alan Cullison and Andrew Higgins, "Forgotten Computer Reveals Thinking Behind Four Years of Al-Qaida Doings," *Wall Street Journal*, December 31, 2001; and Andrew Higgins and Alan Cullison, "Terrorists Odyssey: Saga of Dr. Zawahri Illuminates Roots of Al-Qaida Terror . . .," *Wall Street Journal*, July 2, 2002.

115. Personal communication. See also, Leitenberg, *The Problem of Biological Weapons*, p. 41.

116. "Madrid International Terrorism Conference: Matter of Time Before Chemical Weapons are Used," *Daily Times*, March 9, 2005.

117. "An Acidic Message" [Editorial], *Washington Post*, March 10, 2005.

118. Mark Trevelyan, "France Calls for Global Watchdog on Bio-Warfare Risk," *Reuters*, March 1, 2005.

119. *Report of the Commission on the Intelligence Capabilities of the United States Regarding Weapons of Mass Destruction*, Report to the President of the United States, March 31, 2005, pp. 269-270.

120. Personal communication.

121. *Ibid.*

122. This may be justified in that the declassified documents were never discussed in the report of the 9/11 Commission. On the other hand, the report of this Presidential Commission fiercely attacks the intelligence process for relying on unreliable informants, at the same time as all the *new* information provided in the paragraph quoted from its own report appears to depend on uncorroborated interrogation reports.

123. Personal communication, May 2005.

124. "French Interior Minister: Chemical and Germ Weapons Developed in Pankisi Gorge, Georgia," *Pravada/Interfax* report, March 4, 2005.

125. Paul Haven, "Agents Say al-Qaida's Ability Diminishing," Associated Press, March 13, 2005.
126. JTF-GTMO Information on Detainees, Unclassified, undated, 6 pp.
127. *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD*, Volume III, September 30, 2004. See the CW section of the report, pp. 5-6, 58, 61-62. The BW section, p. 6, of the ISG report also contains a statement on the initial Iraqi BW failure.
128. *Comprehensive Report of the Special Advisor to the DCI on Iraq's WMD*, Volume III, Annex of the CW section, pp. 93-95.
129. Leitenberg, *The Problem of Biological Weapons*, pp. 23-24.
130. *Ibid.*, Part III:4 "The Anthrax Events in the United States in the Fall of 2001," pp. 137-154.
131. Timothy D. Read, *et al.*, "Comparative Genome Sequencing for Discovery of Novel Polymorphisms in *Bacillus Anthracis*," *Science*, No. 296, June 14, 2002, pp. 2028-2033; and Scott Shane, "Distinct Signature Found in '01 Anthrax. Discovery Raises Hope that Source Can be Traced," *Baltimore Sun*, July 4, 2004.
132. "Purchased" seems unlikely. "Appendix B: Johnson-Winegar Review," p. 58, in *Bayes, Bugs, and Bioterrorists: Lessons Learned from the Anthrax Attacks*, K. M. Thompson, *et al.*, Washington, DC: Center for Technology and National Security Policy, National Defense University, April 2005.
133. *DoD Excess Property: Risk Assessment Needed on Public Sales of Equipment that Could be Used to Make Biological Agents*, Testimony by Gregory D. Kutz, U.S. General Accountability Office to the Committee on Government Reform, House of Representatives, GAO-04-817NI, October 7, 2003; "Memorandum," J. Vincent Chase, Chief Investigator, Subcommittee on National Security, Emerging Threats, and International Relations, Committee on Government Reform, House of Representatives, October 2, 2003.
134. The two main popularizers of this phrase, in innumerable press, radio and TV interviews, were Drs. D. A. Henderson and Michael Osterholm.
135. *The Defense Science Board 1997 Summer Study Task Force on DoD Responses to Transnational Threats*, Vol. I, Final Report, October 1997, p. 47.
136. Richard Danzig and Pamela B. Berkowsky, "Why Should We Be Concerned about Biological Warfare," pp. 9-14, in Joshua Lederberg, ed., *Biological Weapons: Limiting the Threat*, Cambridge, MA: MIT Press, 1999. This paper first appeared in *Journal of the American Medical Association*, Vol. 278, No. 5, August 6, 1977, pp. 431-432. For a more thorough discussion, see the section "The Requirements to Produce Biological Agents by Nonstate Groups," in Leitenberg, *The Problem of Biological Weapons*, Part I, Section 4, pp. 35-40. In December 2004, one could find what was not intended as a parody, a description by a university professor of the supposed simplicity of producing chemical agents: "You buy the chemicals, you mix them, and you have sarin." Joby Warrick, "The World after 9/11: The Chemical Threat. An Easier, but Less Deadly, Recipe for Terror," *Washington Post*, December 31, 2004.

137. Personal communication, 2004.
138. See "Official Concern in the United States Regarding the Potential of Terrorist Use of Biological Weapons," in Leitenberg, *The Problem of Biological Weapons*, pp. 29-34, particularly pp. 30 and 34.
139. *Ibid.*, pp. 35-40.
140. Quoted in U.S. Senate, Committee on Foreign Relations, *CBR Warfare and Its Disarmament Aspects – A Study*, August 1960.
141. Anders Norqvist and Åke Forsberg, BWPP Forum website, February 9, 2004.
142. "A Primer on the Future Threat; The Decades Ahead, 1999-2000," July 1999.
143. Reynolds M. Salerno, *et al.*, "A BW Risk Assessment: Historical and Technical Perspectives," *The Nonproliferation Review*, Fall-Winter 2004, pp. 25-55.
144. Dr. Steven M. Block, "The Growing Threat of Biological Weapons," *American Scientist*, Vol. 89, No. 1, January-February 2001, pp. 28-43.
145. Senator Bill Frist, Remarks as Prepared for Delivery: Harvard Medical School of Health Care Policy Seidman Lecture, "Manhattan Project for the 21st Century," June 1, 2005; "Senate Leader Backs Initiative on Biodefense," *New York Times*, June 1, 2005.
146. Ken Alibek with Stephen Handelman, *Biohazard*, New York: Random House, 1999.
147. Dr. Ken Alibek, personal communication, 1999.
148. See Leitenberg, *The Problem of Biological Weapons*, pp. 42-43.
149. Dr. Peter B. Merkle, "Smallpox and Public Health, A Reality Check," *Science*, Vol. 298, October 4, 2002, p. 57.
150. Raymond Gani and Steve Leach, "Epidemiological Determinants for Modeling Pneumonic Plague Outbreaks," *Emerging Infectious Diseases*, Vol. 10, 2004, pp. 608-614; and Jacob Kool, "Risk of Person-to-Person Transmission of Pneumonic Plague," *Clinical Infectious Diseases*, Vol. 40, 2005, pp. 1166-1172.
151. Richard Danzig, *Catastrophic Bioterrorism – What Is To Be Done*, Washington, DC: Center for Technology and National Security Policy, National Defense University, August 2003, p. 5.
152. Richard Danzig, Presentations in Washington, DC, April 15, 2005, and in Fürigen, Switzerland, April 22, 2005. Danzig has been named as the Chair of the "Senior Biodefense 2025 Panel" for the Department of Defense Chemical Biological Defense Program. Briefing by Klaus Schafer [DATSD(CBD)], to the National Defense Industrial Association, February 25, 2005.
153. The Homeland Security Council, *Planning Scenarios: Executive Summaries. Created for Use in National, Federal, State, and Local Homeland Security Preparedness Activities*, July 2004, globalsecurity.org/security/library/report/2004/hsc-planning-scenarios-jjul04.htm.

154. The enormous casualty estimates that various scenarios in recent years have suggested for mortality resulting from aerosol anthrax released over a U.S. city have ranged from half a million to three million for quantities as few as a few kilograms. In 1979-80, U.S. Government intelligence agencies were suggesting that the Soviet release of anthrax in Sverdlovsk was variously "10 pounds," "10 kilos," or "tens of kilograms," although the mortality in this event was under 500 people. In this event, much of the downwind plume of the dispersed anthrax was, however, not over the city but away from the city into the countryside. Dr. Matthew Meselson estimated the amount of anthrax released as in the range of a gram, which would fit the mortality levels better. The ten pounds and ten kilos are both found in the testimony by Dr. Barry Erhlick, AFMIC, in a 1989 Senate hearing. The estimate of "tens of kilograms" appeared in a DIA(?) document dating from October 1981: DAMO-NCC Report, "Alleged Biological Warfare Incident at Sverdlovsk, Classification deleted," October 23, 1981.

155. Dr. Gerald Epstein, "Biodefense: Building a Medical Countermeasure Capability," Testimony before the Bioterrorism and Public Health Preparedness Subcommittee, Committee on Health, Education, Labor, and Pensions, U.S. Senate, February 8, 2005, p. 2.

156. The Center for Biosecurity website for the Atlantic Storm scenario holds three documents, the first of which is discussed in this paper: Atlantic Storm Scenario Assumptions, distributed at the end of Exercise, January 14, 2005; Atlantic Storm Agenda; and, Atlantic Storm, Briefings, January 14, 2005 [the exercise timeline].

157. Personal communication.

158. *Ibid.*

159. David Ruppe, "Threat Mongering," *National Journal*, Vol. 37, No. 17, April 23, 2005, pp. 1218-1225. See p. 1220 for this quotation.

160. Judith Miller, *et al.*, "US Germ Warfare Research Pushes Treaty Limits: Pentagon Says Projects are Defensive and is Pressing Ahead," *New York Times*, September 4, 2001; and J. Miller, *et al.*, *Germs*, New York: Simon and Schuster, 2001, Chapter 12, pp. 287-299.

161. Martin Furmanski, personal communication. I am indebted to Dr. Martin Furmanski for these last points regarding Austrian brewery regulation. He supplies the following two sources: "Strategy & Concept: What Approvals are Necessary?" and "Pub Brewing Technology: Wastes/Effluent/Exhaust air/Noise," both found on the Brauhaus Austria Website accessible at www.Brauhaus-autria.com. Dr. Furmanski has prepared a separate critique of the Atlantic Storm scenario which also extends to the playing of the scenario.

162. Shannon Brownlee, "Clear and Present Danger," *Washington Post Magazine*, October 28, 2001. Emphasis added.

163. Dr. Ken Alibek, Remarks at the Conference "Meeting the Challenges of Bioterrorism: Assessing the Threat and Designing Biodefense Strategies," Fürigen, Switzerland, April 23, 2005.

164. William C. Patrick III, "Biological Terrorism and Aerosol Dissemination," *Politics and the Life Sciences*, Vol. 15, No. 2, September 1996, pp. 208-210.
165. In the author's presence.
166. "Press Statement, Homeland Committee Members Experience Nuclear, Bio War Games," Committee on Homeland Security, U.S. House of Representatives, PRN Newswire, March 9, 2005.
167. John Mintz, "Bioterrorism War Game Shows Lack of Readiness," *Washington Post*, January 15, 2005; and Bob Drogin, "Smallpox Exercise Poses Big Question: Is Anyone Ready?" *Los Angeles Times*, January 17, 2005.
168. Drogin, "Smallpox Exercise Poses Big Question."
169. "Not Science Fiction," *Washington Post*, January 27, 2005.
170. Anne Applebaum, "Only a Game?" *Washington Post*, January 19, 2005.
171. Lawrence M. Wein and Yifan Liu, "Analyzing a Bioterror Attack on the Food Supply: The Case of Botulinum Toxin," *Proceedings of the National Academy of Sciences*, Vol. 102, No. 28, July 12, 2005, pp. 9984-9989.
172. Bruce Alberts, "Modeling Attacks on the Food Supply," *Proceedings of the National Academy of Sciences*, Vol. 102, No. 28, July 12, 2005, pp. 9737-9738.
173. Lawrence M. Wein, "Got Toxic Milk," *New York Times*, May 30, 2005.
174. The model had assumed only a 68 percent denaturation. For decades, this basic problem in mathematical modeling has customarily been referred to as "garbage in-garbage out." A critique of Dr. Wein's *New York Times* op-ed was sent to the *New York Times*, which declined to print it, replying that "As a matter of policy, we do not publish rebuttals. . . ." It was also sent to the editor of the *Proceedings of the National Academy of Sciences*, with the request that the critique be printed at the same time as the original paper. That, too, was rejected. The journal, *Nature*, carried a feature editorial about the PNAS decision to delay publication, as did the *Washington Post*. Both of these also declined to publish the substantive critique in response.
175. D. A. Henderson, "Bioterrorism as a Public Health Threat," *Emerging Infectious Diseases*, Vol. 4, No. 3, July-September 1998. Henderson was the founder of the Johns Hopkins Center for Civilian Biodefense Strategies, which then became the Center for Biosecurity at the University of Pittsburgh, one of the two groups that developed the Atlantic Storm exercise.
176. Jill Dekker-Bellamy, *Next Generation Threat Reduction: Bioterrorism's Challenges and Solutions*, a Report of the Third Meeting of the New Defence Agenda's Bioterrorism Reporting Group, New Defense Agenda, Brussels, Belgium, January 25, 2005, p. 46.
177. William Pope, "Acting Anti-terrorism Coordinator at the U.S. Department of State," quoted in Thomas Orszag-Land, "G-7 to Establish Germ Warfare Crisis Centre," *Jane's Terrorism and Security Monitor*, February 15, 2005.

178. Gary A. Ackerman and Kevin S. Moran, "Bioterrorism and Threat Assessment," WMDC: The Weapons of Mass Destruction Commission, Report No. 22, undated.

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MILTON LEITENBERG began work in the field of arms control in autumn 1966, after a half-dozen years as a researcher and academic in the sciences (Albert Einstein Medical School, Department of Neurology; Vassar College; Northeastern University; and Washington University, St. Louis). In January 1968, he was the first American recruited to work at the Stockholm International Peace Research Institute (SIPRI). He later worked at the Swedish Institute of International Affairs and Cornell University's Center for International Studies/Peace Studies Program. Since 1989, he has been successively Fellow, Senior Scholar, and Senior Research Scholar at the Center for International and Security Studies at the University of Maryland. Since 1966, Leitenberg has authored or edited a half-dozen books, an equal number of commissioned book-length studies, and written some 170 papers, monographs, and book chapters. The first papers dealing with biological weapons were published in 1967, and he was part of the team at SIPRI that produced the six volumes on "The Problem of Chemical and Biological Warfare." Since 1992, he has written or published some 30 papers dealing with various aspects of biological warfare, and in 2004 published the book, "The Problem of Biological Weapons."